

Oral contraceptive use

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Abstract

Objectives

This article profiles Canadian women aged 15 to 49 who use oral contraceptives (OCs), and compares certain of their characteristics with those of non-users. It also examines associations between OC use and selected characteristics, including cardiovascular risk factors.

Data source

The data are from the cross-sectional household component of Statistics Canada's 1996/97 National Population Health Survey. The analysis is based on a sample of 21,996 women aged 15 to 49, weighted to represent an estimated 7.6 million women.

Analytical techniques

Cross-tabulations were used to estimate the percentage of women aged 15 to 49 who use OCs and to compare selected health behaviours of users and non-users. A multiple logistic regression model was used to model relationships between selected characteristics and OC use.

Main results

An estimated 1.3 million women aged 15 to 49, or 18%, reported using OCs in 1996/97. OC use was significantly associated with being young, unmarried, sexually active, and having prescription drug insurance and relatively high education. About one-third of OC users also smoked.

Key words

contraception, smoking, hypertension, cardiovascular disease, stroke, migraine

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Since oral contraceptives first became available in the 1960s, they have been in wide use throughout the world. Convenient and effective (see *Birth control methods*), birth control pills are also beneficial in treating menstrual disorders.^{1,2}

Since their introduction, oral contraceptives have been the subject of numerous epidemiological studies, many of which have focussed on links with cardiovascular disorders and mortality. Decreases in the amount of estrogen in the pill over the past couple of decades appear to have lowered the risks,^{3,4} and several fairly recent studies have found no excess risk for heart attack or stroke.^{4,6} However, some research suggests that oral contraceptive users remain at a slightly increased risk of stroke and heart attack, as well as death from these causes.^{3,7-19} But these studies also state that the increase in risk conferred by the pill is small. Accordingly, researchers consistently conclude that for women without other risk factors of cardiovascular disease, the benefits of today's oral contraceptives certainly outweigh their potential for harm.^{10,20,21}

Relative to the minimal risk attributed to oral contraceptive use, the hazards of other factors are far more important. The findings of numerous studies indicate that

Methods

Data source

This article is based on Statistics Canada's National Population Health Survey (NPHS). The NPHS, which began in 1994/95, collects information about the health of the Canadian population every two years. The survey covers household and institutional residents in all provinces and territories, except persons living on Indian reserves, on Canadian Forces bases, and in some remote areas. The NPHS has both longitudinal and cross-sectional components. Respondents who are part of the longitudinal component will be followed for up to 20 years.

The 1996/97 cross-sectional household sample is made up of longitudinal respondents and respondents who were selected as part of supplemental samples, or buy-ins, in three provinces. The additional respondents were chosen with random digit dialing (RDD) and were included for cross-sectional purposes only.

Individual data are organized into two files: General and Health. Socio-demographic and some health information was obtained for each member of participating households. These data are found in the General file. Additional in-depth health information was collected for one randomly selected household member. The in-depth health information, as well as the information on the General file pertaining to that individual, is found in the Health file.

In households belonging to the cross-sectional buy-in component, one knowledgeable person provided the socio-demographic and health information about all household members for the General file. As well, one household member, not necessarily the same person, was randomly selected to provide in-depth health information about himself or herself for the Health file.

Among individuals in the longitudinal component, the person providing in-depth health information about himself or herself for the Health file was the randomly selected person for that household in cycle 1 (1994/95) and was usually the person who provided information on all household members for the General file in cycle 2 (1996/97).

The 1996/97 cross-sectional response rates for the Health file were 93.1% for the longitudinal component and 75.8% for the RDD component, yielding an overall response rate of 79.0%. Information in the Health file is available for 81,804 randomly selected respondents.

A more detailed description of the NPHS design, sample and interview procedures can be found in published reports.²²⁻²⁴

This analysis is based on cross-sectional data from the Health file for cycle 2. The data were weighted to reflect the sample design, adjustments for non-response, and post-stratification. The findings are based on data provided by 21,996 non-pregnant female respondents aged 15 to 49 living in the 10 provinces, weighted to represent 7.6 million women (Appendix Table A). Of the sampled women, 4,237 (weighted to represent 1.3 million) reported using oral contraceptives within the month prior to their interview. Residents of institutions are not included in this analysis.

Analytical techniques

Frequency distributions and cross-tabulations were used to estimate the percentage of women aged 15 to 49 who use oral contraceptives

and to compare the health-related characteristics of users and non-users. Multiple logistic regression was used to model relationships between selected factors and oral contraceptive use. Based on a review of the literature and availability on the NPHS, several variables were included in the regression model. The following socio-demographic characteristics were selected: age, marital status, number of children younger than 12 in household, sexual activity in past year, immigrant status, education, employment/student status, household income, and drug insurance coverage. Cardiovascular risk factors comprised smoking, high blood pressure, migraine, overweight, and physical inactivity.

Coefficients of variation, standard errors and chi-squared tests of significance were estimated using a weighted bootstrap procedure that provides unbiased estimates of variance.²⁵⁻²⁷

Limitations

This is a descriptive study. Since the NPHS data used in this analysis are cross-sectional, relationships between variables can be described, but causality cannot be inferred.

Some important factors related to use (or non-use) of oral contraceptives may not have been taken into account in the analysis. For example, the prevalence of diabetes was too low to allow its inclusion in the multivariate analysis. Also, no information was available on type of migraine (with or without aura or other neurological symptoms). In addition, some women may use the pill to alleviate the symptoms of menstrual disorders, such as heavy periods or painful menstruation, but such information was not available from the NPHS. For women who use the pill for purposes other than contraception, associations between pill use and variables related to child-bearing are weakened. Because the NPHS did not ask specific questions about methods of birth control, the use of birth control pills could not be analyzed in the context of other means of contraception. The extent to which the characteristics of users of other methods resemble those of oral contraceptive users weakens the associations observed in this analysis.

Although the estrogen content of oral contraceptives has decreased considerably since their introduction in the 1960s, no information is available from the NPHS on the dose or formulation of the pills taken. Estimates based on a sample of Canadian pharmacies indicate that, in 1996, just over one-quarter of all prescriptions dispensed for oral contraceptives were for "third-generation" preparations (those containing progestogens such as desogestrel and norethindrone).²⁸

The time periods to which various questions pertain do not always coincide. For instance, respondents were asked about medication used in the past month, and "birth control pills" was among the list of items read by interviewers. Questions about sexual activity, however, referred to the past 12 months.

Finally, the NPHS data are self- (or proxy-) reported, and the extent to which they are biased because of reporting error is unknown. Self-reporting can be particularly problematic when dealing with sensitive issues such as sexuality.

the level of risk of heart attack or stroke to women who smoke, have high blood pressure, diabetes, or suffer from migraine far surpasses that associated with oral contraceptive use alone.^{8,10,21,29-31} For oral contraceptive users with any of these risk factors, the risks of cardiovascular disease or stroke rise somewhat, and for women who use oral contraceptives and smoke, the risks are multiplied.^{8,11,12,18,21,32-36}

Nevertheless, because the absolute risk to younger women remains small, the pill is considered safe for the vast majority.³⁷ For example, smoking is the factor that, in combination with oral contraceptive use, confers the highest risk of death due to cardiovascular disease. But among women aged 15 to 34 who use today's low-dose estrogen pills and smoke, the number of deaths attributed to the combined effect of oral contraceptive use and smoking is only 3.3 per 100,000 women, compared with 0.59 per 100,000 among non-smoking non-users the same ages, and 0.65 among non-smoking users.²¹

Physicians are advised to closely monitor older oral contraceptive users who have risk factors, as well as those who are particularly susceptible to cardiovascular disease, or to consider an alternative method of contraception.^{10-12,19,31,38} Despite the distinct advantages of the pill as a contraceptive, current guidelines explicitly discourage physicians from prescribing it to women aged 35 or older who smoke heavily (15 or more cigarettes daily).^{39,41} Among oral contraceptive users aged 35 to 44 who smoke, the number of deaths attributed to the combined risk factors is 29.4 per 100,000. This compares with 3.18 deaths per 100,000 among women who neither smoke nor use the pill, and 6.21 among those who do not smoke and do use the pill.²¹ In fact, the risk of death due to cardiovascular causes in older oral contraceptive users who smoke exceeds the risk of death from carrying a pregnancy to term.²¹

In light of the guidelines, it is helpful to look at the use of oral contraceptives according to the presence of cardiovascular risk factors. Reports profiling women who use oral contraceptives have appeared from several countries in recent years,⁴²⁻⁴⁵

and studies carried out in Switzerland and Québec have focussed specifically on smoking in conjunction with oral contraceptive use.^{46,47} A Canadian study reported on the characteristics of women who used oral contraceptives (including risk conditions) in the late 1980s and early 1990s; however, data were not available from all provinces.⁴⁸

Data from the National Population Health Survey (NPHS) provide the opportunity to compare selected characteristics, including cardiovascular risk factors, of Canadian women who use oral contraceptives with those of women who do not (see *Methods* and *Definitions*). This analysis uses data from the second cycle of the NPHS (1996/97) to examine associations between oral contraceptive use and smoking, high blood pressure and other risk factors for women aged 15 through 49. Associations with selected socio-demographic characteristics are also presented.

Birth control methods

Oral contraceptives are just one form of birth control. There are many choices, each with its own advantages and disadvantages. Failure rates vary, depending on how correctly and consistently each method or combination of methods is used. The failure rate is the number of pregnancies expected per 100 women during one year of typical use.

Failure rate of selected contraceptive methods

Contraceptive method	Reported pregnancies per 100 women per year
Combination pill (both estrogen and progestin)	Less than 1 to 2
Intrauterine device (IUD)	Less than 1 to 6
Condom with spermicidal foam or gel	1 to 6
Mini-pill (progestin only)	3 to 6
Condom	2 to 12
Diaphragm with spermicidal foam or gel	3 to 18
Spermicide	3 to 21
Sponge with spermicide	3 to 28
Cervical cap with spermicide	5 to 18
Periodic abstinence (rhythm), all types	2 to 20
No birth control	60 to 85

Data source: Adapted with permission from the Compendium of Pharmaceuticals and Specialties, Table 1, p. B156 (see Reference 40).

Table 1
Socio-demographic characteristics of oral contraceptive (OC) users and non-users, women aged 15 to 49, household population, Canada excluding territories, 1996/97

	OC users		OC non-users		Chi-squared
	'000	%	'000	%	
Total	1,342	100	6,203	100	
Age group					455.8***
15-19	277	21	727	12	
20-24	366	27	521	8	
25-29	309	23	626	10	
30-34	227	17	942	15	
35-49	163	12	3,386	55	
Marital status					252.4***
Married	333	25	3,278	53	
Common-law	161	12	462	7	
Single	773	58	1,857	30	
Previously married	74	6	596	10	
Child(ren) under 12 in household					14.7***
None	887	66	3,545	57	
1 or 2	434	32	2,303	37	
3+	20	2	355	6	
Sexually active in past year					135.2***
Yes	1,188	89	4,344	70	
No	92	7	1,184	19	
Missing	62	5	674	11	
Immigrant					156.2***
Yes	94	7	1,207	19	
No	1,247	93	4,974	80	
Missing	—	—	21†	—	
Education					38.5***
Less than high school graduation	214	16	1,305	21	
High school graduation	193	14	1,157	19	
Some postsecondary	451	34	1,571	25	
Postsecondary graduation	483	36	2,150	35	
Missing	—	—	20	—	
Employed/Student					31.8***
Yes	1,118	83	4,698	76	
No	220	16	1,477	24	
Missing	4	—	28	—	
Household income					ns
Lowest	70	5	254	4	
Lower-middle	119	9	564	9	
Middle	318	24	1,558	25	
Upper-middle	467	35	2,059	33	
Highest	179	13	714	12	
Missing	190	14	1,053	17	
Drug insurance coverage					ns
Yes	877	65	3,915	63	
No	450	34	2,199	35	
Missing	14	1‡	89	1	

Data source: 1996/97 National Population Health Survey, cross-sectional sample, Health file

Notes: Estimates are based on data for women who were not pregnant at the time of their interview. Information on OC use is not available for an estimated 13,480 (n=51) women (0.2%) aged 15 to 49. Detail may not add to totals because of rounding. The chi-squared test used 500 bootstrap weights and included the Rao-Scott second-order correction to account for the complex survey design.⁴⁹

† Coefficient of variation between 16.6% and 25.0%

‡ Coefficient of variation between 25.1% and 33.3%

*** $p \leq 0.001$

-- Amount too small to be expressed

— Nil or zero

ns Chi-squared value did not reach statistical significance.

OC users much younger than non-users

In 1996/97, 1.3 million women aged 15 to 49 (18%) were estimated to have used an oral contraceptive in the last month (Appendix Table B). Oral contraceptive users were strikingly younger than non-users: 71% were under age 30, compared with 30% of non-users (Table 1). Just one-quarter of women who were taking the pill were married, versus over half of non-users. Oral contraceptive users were also less likely than non-users to have children younger than 12 at home. The NPHS findings pertaining to age, marital status and number of children are similar to those reported for oral contraceptive users in Québec in 1987⁴⁷ and the United States during the 1980s and early 1990s.⁴⁵

Not surprisingly, women who used birth control pills were more likely than non-users to be sexually active: 89% versus 70%. Non-users comprised women who were using other means of contraception, as well as those who were using none—perhaps because some of them were not sexually active.

A higher proportion of oral contraceptive users (93%) than non-users (80%) were Canadian-born. The relatively low use of oral contraceptives by immigrants has also been observed in the United States.^{45,50}

Oral contraceptive users differed from non-users when educational attainment was considered: 70% and 60%, respectively, had some education beyond high school. Similarly, profiles of oral contraceptive users in Norway, Italy and the United States have reported higher levels of education among women who use the pill.^{42,45,51} By contrast, a study of oral contraceptive users in Québec did not support this association.⁴⁷

Women using oral contraceptives were more likely to be employed or to be students than those who were not taking the pill. Users and non-users showed similar patterns of household income levels and drug insurance coverage.

One-third of OC users smoke

Among oral contraceptive users, an estimated 458,000 (34%) reported smoking either daily or occasionally (Table 2). A lower proportion of non-

users smoked (30%). Despite substantial evidence that smoking combined with oral contraceptive use sharply increases the risk of cardiovascular and cerebrovascular mortality, studies from Switzerland, Italy and the United States have also found smoking to be more common among users of oral contraceptives than non-users.^{45,46,50} Data from a representative sample of Québec women in 1987 showed that fully 50% of oral contraceptive users aged 15 to 39 in the province were smokers, compared with 41% of non-users.⁴⁷ The high prevalence of smoking among Québec women of child-bearing age reflects the provincial smoking rate, which has generally surpassed that in all other provinces since the mid-1960s.⁵² More consistent with the NPHS estimate, Canadian Heart Health Surveys (CHHS) data from a sample of women aged 18 to 34 collected between 1988 and 1992 in all provinces except Nova Scotia showed that the percentage of smokers among both oral contraceptive users and non-users was 29%.⁴⁸ Data collected for the Behavioral Risk Factor surveys in the United States indicate that, in 1988, the prevalence of smoking among oral contraceptive

users aged 18 to 45 was 24%,⁴⁴ substantially lower than either the CHHS or NPHS estimate for Canada.

According to the NPHS, a very small percentage of pill users (1%) reported high blood pressure. This is reassuring, but perhaps falsely so. Data collected from 1986 to 1992 for the CHHS found that a substantial proportion (42%) of people with measured hypertension were previously unaware that they had this condition.^{53,54} Even among women in the peak child-bearing ages of 18 to 34, when medical consultations are frequent, 19% of hypertensives were unaware of their high blood pressure.⁵⁴ The NPHS data indicate that 17% of pill users reported that their blood pressure had not been measured within the past year, so it is possible that the prevalence of hypertension among pill users is higher than was reported.

The proportion of women with diagnosed migraine did not differ with use of birth control pills: 13% of users as well as non-users reported this condition. This may reflect the somewhat equivocal state of the literature on oral contraceptive use by women with migraine, as well as the fact that physician guidelines for oral contraceptive use differ according to the type of migraine.^{29,55} Although it is widely recognized that oral contraceptive use by patients who have migraine with aura sharply increases the risk of stroke, oral contraceptives have also been suggested as a means of treating migraine.⁵⁶ Thus prescribing physicians may decide that, for many migraine patients, the therapeutic and contraceptive benefits of the pill outweigh the small increase in the absolute risk of stroke.⁸

The percentage of women using oral contraceptives who were overweight was markedly lower (19%), compared with women who said they were not on the pill (30%). This relationship has been observed previously,^{6,43,48,50} and possibly reflects the choice of heavier women not to use the pill, based on the groundless perception that it may cause weight gain.⁴⁷ The percentage of oral contraceptive users categorized as “inactive” in leisure time physical activity (52%) was also significantly lower than the corresponding percentage in non-users (58%).

Table 2
Cardiovascular risk factors in users and non-users of oral contraceptives (OCs), women aged 15 to 49, household population, Canada excluding territories, 1996/97

Cardiovascular risk factor	OC users		OC non-users		Chi-squared
	'000	%	'000	%	
Daily or occasional smoker	458	34	1,854	30	6.0*
High blood pressure	16	1†	222	4	38.3**
No blood pressure check in past year	226	17	1,720	28	61.2**
Migraine	181	13	809	13	ns
Overweight	251	19	1,833	30	67.8**
Physical inactivity	697	52	3,593	58	11.0**

Data source: 1996/97 National Population Health Survey, cross-sectional sample, Health file

Notes: Estimates are based on data for women who were not pregnant at the time of their interview. Information on OC use is not available for an estimated 13,480 (n=51) women (0.2%) aged 15 to 49. The chi-squared test used 500 bootstrap weights and included the Rao-Scott second-order correction to account for the complex survey design.⁴⁹

† Coefficient of variation between 16.6% and 25.0%

* $p \leq 0.05$

** $p \leq 0.01$

ns Chi-squared value did not reach statistical significance.

Table 3
Smoking, migraine and blood pressure check in users and non-users of oral contraceptives (OCs), by age group, women aged 15 to 49, household population, Canada excluding territories, 1996/97

Risk factor	15-34					35-49				
	OC users		OC non-users		Chi-squared	OC users		OC non-users		Chi-squared
	'000	%	'000	%		'000	%	'000	%	
Daily or occasional smoker	430	37	843	30	10.5**	28	17†	1,011	30	12.5***
Migraine	156	13	334	12	ns	25	15	475	14	ns
No blood pressure check in past year	213	18	887	31	64.8***	13	8†	833	25	41.9***

Data source: 1996/97 National Population Health Survey, cross-sectional sample, Health file

Notes: Estimates are based on data for women who were not pregnant at the time of their interview. Information on OC use is not available for an estimated 13,480 (n = 51) women (0.2%) aged 15 to 49. The chi-squared test used 500 bootstrap weights and included the Rao-Scott second-order correction to account for the complex survey design.⁴⁹

† Coefficient of variation between 16.6% and 25.0%

** p ≤ 0.01

*** p ≤ 0.001

ns Chi-squared value did not reach statistical significance.

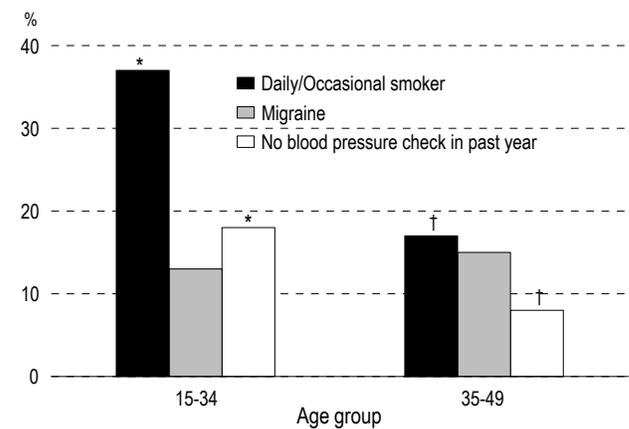
Because the risk of cardiovascular mortality increases with age, selected risk factors were further examined for oral contraceptive users and non-users by age group. For women aged 15 to 34, smoking was more common among users of oral contraceptives compared with non-users (Table 3). This suggests that, in this younger age group, smoking is not a deterrent to using the pill. The proportion of oral contraceptive users who were heavy smokers (15 or more cigarettes per day) was 14%, similar to the proportion of heavy smokers among non-users these ages (data not shown). Similarly, migraine, which was present to about the same extent in both users and non-users, evidently does not limit pill use among women in this age group.

Among 35- to 49-year-old women, the percentage of oral contraceptive users who smoked (17%) was appreciably lower than that for non-users (30%). Nonetheless, the NPHS data indicate that of the estimated 28,000 women in this age group who used the pill and smoked, 17,000 (data not shown) smoked heavily (at least 15 cigarettes per day). Perhaps doctors decide that, for some older women who smoke, effective contraception takes priority over other health risks.

The proportion of oral contraceptive users aged 35 to 49 who reported being diagnosed with migraine was nearly the same as that for non-users in the same age group—a somewhat unexpected

finding. On the basis of a recent literature review, it has been suggested that the use of oral contraceptives may not be appropriate for women aged 35 or older who suffer from migraine, or in whom other major risk factors for stroke such as high blood pressure or smoking are present.³⁸

Chart 1
Percentage of oral contraceptive users with selected cardiovascular risk factors, by age group, women aged 15 to 49, household population, Canada excluding territories, 1996/97



Data source: 1996/97 National Population Health Survey, cross-sectional sample, Health file

Notes: Estimates are based on data for women who were not pregnant at the time of their interview. Information on oral contraceptive use is not available for an estimated 13,480 (n = 51) women (0.2%) aged 15 to 49.

† Coefficient of variation between 16.6% and 25.0%

* Significantly higher than corresponding value for 35-to-49 age group (p < 0.05)

In the context of previous studies showing that substantial proportions of people with high blood pressure remain either untreated or unaware of their condition,^{53,54} NPHS data on women whose blood pressure was not checked in the past year were examined. In both age groups, but especially the older one, a lower proportion of oral contraceptive users than non-users reported that their blood pressure had not been measured in the past year. The percentages for smoking and no blood pressure check in the past year were over twice as high in pill users aged 15 to 34 as they were in users aged 35 to 49 (Chart 1). However, the prevalence of migraine in these age groups did not differ significantly.

Being young, single, childless associated with pill use

Multivariate analysis, undertaken to account for the simultaneous effects of all variables, revealed significantly high odds of oral contraceptive use in all five-year age groups under age 35, compared with women aged 35 to 49 (Table 4). The odds of oral contraceptive use for women who were previously married, single or living in a common-law relationship were each significantly high, compared with those for women who were married. Also, even with the effects of age and marital status taken into account, women with three or more children under age 12 had significantly low odds of oral contraceptive use, compared with women with no children. The use of other means of contraception (such as tubal ligation or vasectomy) may have been greater among these women than among women with no young children. As expected, the odds for oral contraceptive use in sexually active women were much higher than those for women who were not sexually active. Finally, the odds of oral contraceptive use for immigrants were significantly lower than those for Canadian-born women.

Higher education, drug insurance related to pill use

The odds of oral contraceptive use were significantly higher for women with postsecondary education than for those for women who did not have this level of schooling.

Table 4
Adjusted odds ratios of oral contraceptive use for selected socio-demographic characteristics and cardiovascular risk factors, women aged 15 to 49, household population, Canada excluding territories, 1996/97

	Adjusted odds ratio	95% confidence interval
Age group		
15-19	9.1*	6.3, 13.3
20-24	10.3*	7.7, 14.0
25-29	8.2*	6.4, 10.6
30-34	4.9*	3.8, 6.5
35-49†	1.0	...
Marital status		
Married†	1.0	...
Common-law	1.6*	1.2, 2.1
Single	2.5*	1.9, 3.2
Previously married	2.0*	1.4, 2.8
Child(ren) under 12 in household		
None†	1.0	...
1-2	0.9	0.8, 1.1
3+	0.3*	0.2, 0.4
Sexually active in past year‡	8.5*	6.1, 12.0
Immigrant‡	0.5*	0.3, 0.6
Postsecondary education‡	1.4*	1.2, 1.7
Employed/Student‡	1.1	0.9, 1.3
High household income‡	1.0	0.7, 1.3
Drug insurance coverage‡	1.3*	1.1, 1.5
Cardiovascular risk factor		
Daily or occasional smoker‡	0.8*	0.7, 1.0
High blood pressure‡	0.9	0.5, 1.5
Migraine‡	1.0	0.8, 1.2
Overweight‡	0.7*	0.6, 0.9
Physically inactive‡	1.0	0.9, 1.2

Data source: 1996/97 National Population Health Survey, cross-sectional sample, Health file

Notes: The analysis is based on a sample of 20,996 women aged 15 to 49, of whom 4,105 were using oral contraceptives. "Unknown" categories for sexual activity in the past year, income and body mass index were included in the analysis to maximize the sample size; their odds ratios are not shown. 949 women in this age group were missing information on other independent variables and were excluded from the analysis, along with an additional 51 women who were missing information on OC use. Because of rounding, some confidence intervals with 1.0 as the upper limit were significant.

† Reference category, for which odds ratio is always 1.0

‡ Reference category is absence of the characteristic; for example, the reference categories for immigrant and high blood pressure are Canadian-born and no diagnosis of high blood pressure, respectively.

... Not applicable

*p < 0.05

Employment or student status and income were not significantly associated with pill use. The odds of pill use were higher, however, among those who reported having drug insurance coverage than for women who had no such benefits.

Definitions

National Population Health Survey (NPHS) respondents were asked: "In the past month, did you take any of the following medications?" Birth control pills were included in the list read by interviewers.

Five *age groups* were established for this analysis: 15 to 19, 20 to 24, 25 to 29, 30 to 34, and 35 to 49, the group least likely to use oral contraceptives.

Respondents were asked for their current *marital status*. Four categories were used for this analysis: married (now married); common-law (including those who said they were "living with a partner"); single (never married); and previously married, which includes women who were widowed, separated or divorced.

A derived variable was created that classified *number of children less than 12 in household* into the following categories: none, one or two, and three or more.

Women who said they had sexual intercourse in the past 12 months were considered to be *sexually active*. Women who reported not having had intercourse in the past 12 months were categorized as not sexually active.

Immigrant status was determined by asking: "In what country were you born?"

Education was classified as less than high school graduation, high school graduation, some postsecondary, and postsecondary graduation. *Postsecondary education* comprises the latter two groups.

Respondents who said that they were currently working were identified as *employed*. An individual currently attending a school, college or university was classified as a *student*.

Household income levels were calculated by considering total household income and the number of people in the household:

Household income group	People in household	Total household income
Lowest	1 to 4	Less than \$10,000
	5 or more	Less than \$15,000
Lower-middle	1 or 2	\$10,000 to \$14,999
	3 or 4	\$10,000 to \$19,999
	5 or more	\$15,000 to \$29,999
Middle	1 or 2	\$15,000 to \$29,999
	3 or 4	\$20,000 to \$39,999
	5 or more	\$30,000 to \$59,999
Upper-middle	1 or 2	\$30,000 to \$59,999
	3 or 4	\$40,000 to \$79,999
	5 or more	\$60,000 to \$79,999
Highest	1 or 2	\$60,000 or more
	3 or 4	\$80,000 or more
	5 or more	\$80,000 or more

High household income comprises the three highest groups.

To establish *drug insurance* coverage, respondents were asked: "Do you have insurance that covers all or part of the cost of your prescription medications (including private, government- or employer-paid plans)?"

To establish smoking status, respondents were asked if, at the time of the interview, they smoked cigarettes *daily*, *occasionally*, or not at all. For daily smokers, the number of cigarettes smoked per day was categorized as fewer than 15 and 15 or more (heavy).

Respondents were asked if they had "long-term conditions that have lasted or are expected to last six months or more and that have been diagnosed by a health professional." The interviewer read a list of chronic conditions. *High blood pressure* and *migraine* were among the risk factors relevant to this analysis. Although diabetes was also relevant, the number of respondents who reported this diagnosis was too small for the variable to be included.

To establish *blood pressure check in past year*, respondents were asked, "When was the last time you had your blood pressure taken?"

The *Canadian Guidelines for Healthy Weights*⁵⁷ uses body mass index (BMI) to determine an acceptable range of healthy weights and to identify conditions of excess weight and underweight. BMI is calculated by dividing weight in kilograms by height in metres squared. Four weight categories are identified based on BMI:

- Underweight (BMI less than 20)
- Acceptable weight (BMI 20 to 24.9)
- Some excess weight (BMI 25 to 27)
- Overweight (BMI greater than 27)

These guidelines are recommended for everyone aged 20 to 64, excluding pregnant women. In accordance with these guidelines, women whose BMI was 25 or higher were classified as being *overweight* for this analysis. Those with a BMI of less than 25 were defined as not overweight.

To derive physical activity level, respondents' energy expenditure (EE) was estimated for each activity they engaged in during their leisure time. EE was calculated by multiplying the number of times a respondent engaged in an activity over a 12-month period by the average duration in hours and by the energy cost of the activity (expressed in kilocalories expended per kilogram of body weight per hour of activity). To calculate an average daily EE for the activity, the estimate was divided by 365. This calculation was repeated for all leisure-time activities reported, and the resulting estimates were summed to provide an aggregate average daily EE. Respondents whose estimated leisure-time EE was below 1.5 kcal/kg/day were considered *physically inactive*. Those with a value of 1.5 or higher were considered physically active.

Lower odds for smoking, overweight

Smoking was negatively related to pill use—a somewhat surprising finding, given that a greater percentage of users than non-users were smokers (Table 2). However, when smoking was entered alone into a logistic regression model, the odds ratio in relation to oral contraceptive use was significantly high, indicating that without adjusting for the effects of other variables, the odds of oral contraceptive use were higher among women who smoked than in non-smokers (data not shown). The low odds ratio for smoking in the multivariate analysis indicates that differences between contraceptive users and non-users—other than smoking status—accounted for use of the pill.

The adjusted odds ratio for high blood pressure did not attain statistical significance, partly as a result of the small number of women aged 15 to 49 with this condition. The adjusted odds of oral contraceptive use by overweight women were significantly lower than the odds for women who were not overweight. Neither migraine nor being physically inactive was associated with pill use.

Concluding remarks

The socio-demographic profile of Canadian women who use oral contraceptives that emerges from the 1996/97 National Population Health Survey is fairly consistent with what has been shown in other populations. Oral contraceptive users tend to be young, unmarried, sexually active women who are relatively well-educated.

Two of the cardiovascular risk factors examined in this analysis, overweight and smoking, were negatively associated with oral contraceptive use when the effects of other influences were taken into account. These findings are encouraging, in view of clinical guidelines that advise against prescribing oral contraceptives to women with risk factors for cardiovascular disease or stroke. Although the lowered odds ratio for hypertension in relation to oral contraceptive use was not statistically significant, relatively few women with known high blood pressure reported taking the pill (Appendix Table B), and a large majority of older users reported that

their blood pressure had been checked within the past year.

There is still some cause for concern, however. The NPHS data indicate that just over one-third of all oral contraceptive users smoke, and a substantial number smoke heavily. Despite the higher risk of death from stroke and heart attack that the combination of smoking and oral contraceptive use confers, one-sixth of older oral contraceptive users—an estimated 28,000 women aged 35 to 49—also reported that they smoked.

One physician has observed that the continued combination of oral contraceptive use with smoking, despite clear evidence of the risks involved, signals an important shortcoming of medical care.⁴⁷ Other Canadian researchers have suggested that the combination of oral contraceptive use and smoking indicates a low level of awareness of the health risks.⁴⁸ However, it also serves as a reminder of the difficulties of dealing with a strong addiction, and offers an opportunity for preventive intervention. ●

References

- 1 Tierney LM, McPhee SJ, Papadakis MA, eds. *Current Medical Diagnosis and Treatment*, 38th edition. Stamford, Connecticut, Appleton and Lange, 1999.
- 2 Egarter C, Topcoughlu MS, Imhof M, et al. Low-dose oral contraceptives and quality of life. *Contraception* 1999; 59: 287-91.
- 3 Thorogood M. Oral contraceptives and myocardial infarction: new evidence leaves unanswered questions. *Thrombosis and Haemostasis* 1997; 78(1): 334-8.
- 4 Schwartz SM, Siscovick DS, Longstreth WT Jr, et al. Use of low-dose oral contraceptives and stroke in young women. *Annals of Internal Medicine* 1997; 127: 596-603.
- 5 Sidney S, Siscovick DS, Petitti DB, et al. Myocardial infarction and use of low-dose oral contraceptives: a pooled analysis of two US studies. *Circulation* 1998; 98(11): 1058-63.
- 6 Petitti DB, Sidney S, Bernstein A, et al. Stroke in users of low-dose oral contraceptives. *The New England Journal of Medicine* 1996; 335(1): 8-15.
- 7 Hannaford PC, Croft PR, Kay CR. Oral contraception and stroke: Evidence from the Royal College of General Practitioners' Oral Contraception Study. *Stroke* 1994; 25(5): 935-42.
- 8 Lidegaard Ø. Oral contraceptives, pregnancy and the risk of cerebral thromboembolism: the influence of diabetes, hypertension, migraine and previous thrombotic disease. *British Journal of Obstetrics and Gynaecology* 1995; 102: 153-9.

- 9 World Health Organization. Haemorrhagic stroke, overall stroke risk, and combined oral contraceptives: results of an international, multicentre, case-control study. WHO Collaborative Study of Cardiovascular Disease and Steroid Hormone Contraception. *The Lancet* 1996; 348: 505-10.
- 10 Johnston SC, Colford JM Jr, Gress DR. Oral contraceptives and the risk of subarachnoid hemorrhage: a meta-analysis. *Neurology* 1998; 51: 411-8.
- 11 Farley TMM, Collins J, Schlesselman JJ. Hormonal contraception and risk of cardiovascular disease: an international perspective. *Contraception* 1998; 57: 211-30.
- 12 Petitti DA, Sidney S, Quesenberry CP. Oral contraceptive use and myocardial infarction. *Contraception* 1998; 57: 143-55.
- 13 Haapaniemi H, Hillbom M, Juvela S. Lifestyle-associated risk factors for acute brain infarction among persons of working age. *Stroke* 1997; 28(1): 26-30.
- 14 Chasan-Taber L, Stampfer MJ. Epidemiology of oral contraceptives and cardiovascular disease. *Annals of Internal Medicine* 1998; 128(6): 467-77.
- 15 Farmer RDT, Lawrenson RA, Thompson CR, et al. Population-based study of risk of venous thromboembolism associated with various oral contraceptives. *The Lancet* 1997; 349: 83-8.
- 16 World Health Organization. Effect of different progestagens in low oestrogen oral contraceptives on venous thromboembolic disease. WHO Collaborative Study of Cardiovascular Disease and Steroid Hormone Contraception. *The Lancet* 1995; 346: 1582-8.
- 17 Jick H, Jick SS, Gurewich V, et al. Risk of idiopathic cardiovascular death and nonfatal venous thromboembolism in women using oral contraceptives with differing progestagen components. *The Lancet* 1995; 346: 1589-93.
- 18 Lewis MA, Heinemann LAJ, Spitzer WO, et al. The use of oral contraceptives and the occurrence of acute myocardial infarction in young women: results from the transnational study on oral contraceptives and the health of young women. *Contraception* 1997; 56: 129-40.
- 19 Lidegaard Ø. Smoking and use of oral contraceptives: Impact on thrombotic diseases. *American Journal of Obstetrics and Gynecology* 1999; S357-63.
- 20 Carr BR, Ory H. Estrogen and progestin components of oral contraceptives: relationship to vascular disease. *Contraception* 1997; 55: 267-72.
- 21 Schwingl PJ, Ory HW, Visness CM. Estimates of the risk of cardiovascular death attributable to low-dose oral contraceptives in the United States. *American Journal of Obstetrics and Gynecology* 1999; 180: 241-9.
- 22 Tambay J-L, Catlin G. Sample design of the National Population Health Survey. *Health Reports* (Catalogue 82-003) 1995; 7(1): 29-38.
- 23 Swain L, Catlin G, Beaudet MP. The National Population Health Survey—its longitudinal nature. *Health Reports* (Statistics Canada, Catalogue 82-003) 1999; 10(4): 69-80.
- 24 Statistics Canada. *National Population Health Survey, 1996/97. Household Component, User's Guide for the Public Use Microdata Files* (Statistics Canada, Catalogue 82-M0009GPE) Ottawa: Statistics Canada, 1998.
- 25 Rao JNK, Wu CFJ, Yue K. Some recent work on resampling methods for complex surveys. *Survey Methodology* (Statistics Canada, Catalogue 12-001) 1992; 18(2): 209-17.
- 26 Rust KF, Rao JNK. Variance estimation for complex surveys using replication techniques. *Statistical Methods in Medical Research* 1996; 5: 283-310.
- 27 Yeo D, Mantel H, Liu TP. Bootstrap variance estimation for the National Population Health Survey. *American Statistical Association: Proceedings of the Survey Research Methods Section*. Baltimore: August 1999.
- 28 International Marketing Advisory Services Division, IMS of Canada. *Canadian Compuscript*, 1994 and 1996. Data used with permission.
- 29 Becker WJ. Use of oral contraceptives in patients with migraine. *Neurology* 1999; 53(Suppl. 1): S19-25.
- 30 Chasan-Taber L, Willett WC, Manson JE, et al. Prospective study of oral contraceptives and hypertension among women in the United States. *Circulation* 1996; 94(3): 483-9.
- 31 Mattson RH, Rebar RW. Contraceptive methods for women with neurologic disorders. *American Journal of Obstetrics and Gynecology* 1993; 168: 2027-32.
- 32 Rosenberg L, Kaufman DW, Helmrich SP, et al. Myocardial infarction and cigarette smoking in women younger than 50 years of age. *Journal of the American Medical Association* 1985; 253(20): 2965-9.
- 33 World Health Organization. Acute myocardial infarction and combined oral contraceptives: results of an international multicentre case-control study. WHO Collaborative Study of Cardiovascular Disease and Steroid Hormone Contraception. *The Lancet* 1997; 349: 1202-9.
- 34 World Health Organization. Cardiovascular disease and use of oral and injectable progestogen-only contraceptives and combined injectable contraceptives. Results of an international, multicenter, case-control study. WHO Collaborative Study of Cardiovascular Disease and Steroid Hormone Contraception. *Contraception* 1998; 57(5): 315-24.
- 35 Chang CL, Donaghy M, Poulter N, et al. Migraine and stroke in young women: case-control study. World Health Organization Collaborative Study of Cardiovascular Disease and Steroid Hormone Contraception. *British Medical Journal* 1999; 318: 13-28.
- 36 Roy S. Effects of smoking on prostacyclin formation and platelet aggregation in users of oral contraceptives. *American Journal of Obstetrics and Gynecology* 1999; 180: S364-8.
- 37 Schwartz SM, Petitti DB, Siscovick DS, et al. Stroke and use of low-dose oral contraceptives in young women: a pooled analysis of two US studies. *Stroke* 1998; 29: 2277-84.
- 38 Becker WJ. Migraine and oral contraceptives. *Canadian Journal of Neurological Sciences* 1997; 24(1): 16-21.
- 39 Schiff I, Bell WR, Davis V, et al. Oral contraceptives and smoking, current considerations: Recommendations of a consensus panel. *American Journal of Obstetrics and Gynecology* 1999; 180: S383-4.
- 40 Canadian Pharmaceutical Association. *Compendium of Pharmaceuticals and Specialties*, 31st edition. Ottawa: Canadian Pharmaceutical Association, 1996.

- 41 Williams RS. Benefits and risks of oral contraceptive use. *Postgraduate Medicine* 1992; 92(7): 155-71.
- 42 Jacobsen BK, Lund E, Kvåle G. Childbearing and use of oral contraceptives: impact of educational level. The Nordland Health Study. *Journal of Epidemiology and Community Health* 1992; 46: 216-7.
- 43 Dong W, Colhoun HM, Poulter NR. Blood pressure in women using oral contraceptives: results from the Health Survey for England 1994. *Journal of Hypertension* 1997; 15(10): 1063-8.
- 44 Barrett DH, Anda RF, Escobedo LG, et al. Trends in oral contraceptive use and cigarette smoking; Behavioral Risk Factor Surveillance System, 1982 and 1988. *Archives of Family Medicine* 1994; 3: 438-43.
- 45 Flint PM, Lapane KL, Barbour MM et al. Cardiovascular risk profiles of oral contraceptive users and nonusers: a population-based study. *Preventive Medicine* 1995; 24: 586-90.
- 46 Morabia A, Bernstein M, Bleed D, et al. Oral contraceptive use in relation to smoking. *Acta Obstetrica et Gynecologica Scandinavica* 1998; 77: 205-9.
- 47 Sharpe CR. Smoking among oral contraceptive users in Quebec in 1987. *Journal of Clinical Epidemiology* 1994; 47(3): 313-23.
- 48 Connelly PW, Stachenko S, MacLean DR, et al. The prevalence of hyperlipidemia in women and its association with use of oral contraceptives, sex hormone replacement therapy and nonlipid coronary artery disease risk factors. *Canadian Journal of Cardiology* 1999; 15(4): 419-27.
- 49 Hume AL, Barbour MM, Lapane KL, et al. Correlates of oral contraceptive use in two New England communities: 1981-1993. *Pharmacotherapy* 1996; 16(6): 1173-8.
- 50 Parazzini F, Negri E, Ricci E, et al. Correlates of oral contraceptive use in Italian women, 1991-93. *Contraception* 1996; 54: 101-6.
- 51 Rao JNK, Thomas DR. Chi-squared tests for contingency tables. In: Skinner CJ, Holt D, Smith TMF, eds. *Analysis of Complex Surveys*. New York: Wiley, 1989: 89-114.
- 52 Stephens M, Siroonian J. Smoking prevalence, quit attempts and successes. *Health Reports* (Statistics Canada, Catalogue 82-003) 1998; 9(4): 31-7.
- 53 Chockalingam A, Fodor JG. Treatment of raised blood pressure in the population: the Canadian experience. *American Journal of Hypertension* 1998; 11(5, Part 1): 747-9.
- 54 Joffres MR, Ghadirian P, Fodor JG, et al. Awareness, treatment, and control of hypertension in Canada. *American Journal of Hypertension* 1997; 10(10, Part 1): 1097-102.
- 55 Grimes DA, Chaney EJ, Connell EB, et al., eds. Headache, migraine and oral contraceptives. *The Contraception Report* 1998; 8(6): 12-14.
- 56 Silberstein SD. Menstrual migraine. *Journal of Women's Health and Gender-based Medicine* 1999; 8(7): 919-31.
- 57 National Health and Welfare. *Canadian Guidelines for Healthy Weights*. Report of an Expert Group convened by the Health Promotion Directorate, Health Services and Promotion Branch. Ottawa: Minister of National Health and Welfare, 1988.

Appendix

Table A

Distribution of selected characteristics, women aged 15 to 49, household population, Canada excluding territories, 1996/97

	Sample size	Estimated population			Sample size	Estimated population	
		'000	%			'000	%
Total	21,996	7,558	100	Total	21,996	7,558	100
Age group				Household income			
15-19	2,151	1,007	13	Lowest	970	326	4
20-24	2,628	889	12	Lower-middle	2,149	683	9
25-29	3,167	936	12	Middle	4,963	1,878	25
30-34	3,894	1,170	16	Upper-middle	6,859	2,528	34
35-49	10,156	3,557	47	Highest	2,676	893	12
				Missing	4,379	1,248	17
Marital status				Drug insurance coverage			
Married	10,787	3,618	48	Yes	14,292	4,793	63
Common-law	1,351	623	8	No	7,309	2,653	35
Single	7,302	2,633	35	Missing	395	112	2
Previously married	2,508	672	9				
Missing	48	--	--	Smoker			
Child(ren) under 12 in household				Daily or occasional	7,013	2,314	31
None	12,406	4,440	59	Former	5,431	1,872	25
1 or 2	8,198	2,742	36	Never	9,490	3,353	44
3+	1,392	375	5	Missing	62	19 [†]	--
Sexually active in past year				High blood pressure			
Yes	15,756	5,533	73	Yes	761	238	3
No	3,472	1,276	17	No	21,217	7,314	97
Missing	2,768	748	10	Missing	18	--	--
Immigrant				No blood pressure check in last year			
Yes	2,934	1,304	17	Yes	16,493	1,947	73
No	18,997	6,231	82	No	5,087	5,488	26
Missing	65	23	--	Missing	416	123	2
Education				Migraine			
Less than high school graduation	3,952	1,522	20	Yes	3,092	992	13
High school graduation	4,220	1,351	18	No	18,898	6,564	87
Some postsecondary	5,501	2,027	27	Missing	6	--	--
Postsecondary graduation	8,223	2,635	35	Overweight			
Missing	100	22	--	Yes	6,489	2,089	28
Employed/Student				No	14,188	5,140	68
Yes	16,890	5,824	77	Missing	1,319	329	4
No	4,972	1,701	23	Physically inactive			
Missing	134	33	--	Yes	12,050	4,296	57
				No	9,639	3,162	42
				Missing	307	101	1

Data source: 1996/97 National Population Health Survey, cross-sectional sample, Health file

Note: Detail may not add to totals because of rounding.

[†] Coefficient of variation between 16.6% and 25.0%

[‡] Coefficient of variation greater than 33.3%

-- Amount too small to be expressed

Table B
Prevalence of oral contraceptive (OC) use, by selected socio-demographic characteristics and cardiovascular risk factors, women aged 15 to 49, household population, Canada excluding territories, 1996/97

	OC users		Prevalence of OC use
	Sample size	Estimated population	
		'000	%
Total	4,237	1,342	18
Age group			
15-19	555	277	27
20-24	1,180	366	41
25-29	1,141	309	33
30-34	828	227	19
35-49	533	163	5
Marital status			
Married	1,324	333	9
Common-law	433	161	26
Single	2,168	773	29
Previously married	307	74	11
Child(ren) under 12 in household			
None	2,625	887	20
1 or 2	1,473	434	16
3+	139	20	5
Immigrant			
Yes	302	94	7
No	3,932	1,247	20
Postsecondary education			
Yes	2,915	934	20
No	1,315	407	14
Employed/Student			
Yes	3,507	1,118	19
No	716	220	13
High household income			
Yes	2,848	963	18
No	1,389	189	19
Drug insurance coverage			
Yes	2,792	877	18
No	1,392	450	17
Sexually active in past year			
Yes	3,655	1,188	21
No	268	92	7
Cardiovascular risk factors			
Regular or occasional smoker			
Yes	1,383	458	20
No	2,851	883	17
High blood pressure			
Yes	74	16	7
No	4,158	1,324	18
Migraine			
Yes	644	181	18
No	3,592	1,161	18
Overweight			
Yes	968	251	12
No	3,089	1,053	20
Physically inactive			
Yes	2,112	697	16
No	2,080	633	20

Data source: 1996/97 National Population Health Survey, cross-sectional sample, Health file

Notes: Estimates are based on data for women who were not pregnant at the time of their interview. Information on OC use is not available for an estimated 13,480 (n=51) women (0.2%) aged 15 to 49. Detail may not add to totals because of rounding.