

Cigarette consumption in Canada
by sex, age and birth cohort
1921-85

by

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Text

Cigarette consumption in Canada by sex, age and birth cohort 1921-85

Introduction

The purpose of this paper is to provide estimates of the numbers of manufactured and handmade cigarettes smoked in Canada, analysed by sex, age and year of birth cohort, during the years 1921-85 in so far as the data available permitted what would appear to be reasonably reliable assumptions about trends in past years to be made. In order to provide estimates of cigarette consumption by cohorts of men and women who had been born within successive periods of five years, the consumption figures had to be estimated by sex and 5-year age groups for each quinquennium. Consumption of handmade cigarettes has been important in Canada. Consequently, estimates of both manufactured and handmade cigarette consumption by sex, 5-year age groups and birth cohorts were required. Unfortunately, it was not possible to find reasonably reliable assumptions on which estimates of handmade cigarette consumption prior to 1955 could be based.

1. Estimates of cigarette consumption in Canada by sex and 5 or 8 age groups 1956-85

1.1 Statistics of national annual consumption of each type of cigarette

The first requirements are statistics of the annual consumption in Canada of both manufactured and handmade cigarettes. There is no difficulty in obtaining domestic sales of manufactured cigarettes. They are currently published by Statistics Canada and were previously published by that Department's predecessors on the basis of taxes paid on manufactured cigarettes by manufacturers and importers. The sales, however, are sales to the distributive trade rather than sales to the public. Nevertheless, these two sets of sales figures for any calendar year would have differed only in so far as distributors had increased or reduced their stocks at 31st December compared with those at the previous year end. This paper is concerned with cigarette sales during quinquennia and any stock changes at the end of a quinquennium are likely to have been negligible in comparison with sales during the quinquennium. Consequently, sales to the distributive trade during a quinquennium can be taken as equivalent in practice to sales to the public.

There has never been any basis on which precise estimates could be made of the numbers of handmade cigarettes smoked in Canada. The most reliable basis for any such estimates would have been the total sales of the cigarette papers used by smokers in making their own cigarettes. Statistics of annual sales of cigarette papers are available, for example, in the Federal Republic of Germany and in Norway but not in Canada. Moreover, even if the annual sales of cigarette papers in Canada were known, allowance would have to be made for wastage of these flimsy pieces of tissue and for their use in making cigarettes of

marihuana and other non-tobacco materials. From figures for the Federal Republic of Germany published by Merzdorf et al. (1982, p.199) it appeared that during 1976-79, the number of handmade cigarettes estimated to have been smoked amounted to about 86% of the cigarette papers sold. For Canada a different approach has had to be adopted. Handmade cigarettes contain fine cut tobacco. This is essential to ensure that the cigarettes burn and smoulder slowly and uniformly. Sales of fine cut tobacco can therefore provide a guide to the amount of tobacco used in handmade cigarettes provided allowances can be made for the amount smoked in pipes. Both light and dark tobacco can be sold in fine cut form. Fine cut dark tobacco would have been smoked almost wholly in pipes; fine cut light tobacco would have been smoked primarily in handmade cigarettes but in the past quantities have been smoked in pipes in at least the UK and the Netherlands and the same may be expected to have occurred in Canada. The quantities of fine cut tobacco smoked in pipes would have decreased as pipe smoking declined.

Official statistics of sales of what was described as "fine cut tobacco intended for cigarettes" (which presumably meant fine cut light tobacco) have been published in Canada from 1973. No estimates are available of amounts smoked in pipes. Prior to 1973 even less information was available. The only official statistics of the sales of tobacco were then of "tobacco for hand-rolled cigarettes and pipe". However, estimates of the numbers of handmade cigarettes likely to have been smoked in Canada during 1965 and 1968-81 have been made by Mr. Wayne Millar of Health and Welfare Canada (Millar (1983) tables 47 and 48). In these estimates, Millar assumed that all "fine cut tobacco intended for cigarettes" had been so used and that the average handmade

cigarette had contained one gram of tobacco. Neither assumption may have been wholly accurate. As already mentioned, an unknown but decreasing quantity of "fine cut tobacco intended for cigarettes" may have been smoked in pipes. The only estimates of the weight of tobacco inserted into handmade cigarettes by their smokers have come from a very small survey by Mrs.E.L.Chamberlin in 1986 which can be used as no more than a possible pointer (W.F. Forbes, private communication). This survey pointed to the possibility that 70 mm handmade cigarettes in papers without filters may have contained an average of 0.69 g of tobacco and 80 mm handmade cigarettes in pre-formed tubes with filters an average of 0.93 g of tobacco. If these two main types of handmade cigarettes formed respectively about 40% and 60% of the total smoked, the overall average tobacco content would have been about 0.83 grams. In earlier years, when the proportion of filter handmade cigarettes was lower, the average tobacco content would also have been lower. But if Millar should have over-estimated both the quantity of "fine cut tobacco intended for cigarettes" that was so used and the average tobacco content of handmade cigarettes, the errors are likely to have been small and at least partially to have offset each other. In estimating the numbers of handmade cigarettes smoked in Canada during 1955-67 and 1982-85 in this paper, the writer has made the same assumptions as Millar.

The national sales of "tobacco for hand-rolled cigarettes and pipe", given in table 1.1, were fairly stable during the years 1955-72. This suggests that consumption of both types of products may have been relatively unchanged in total during these years. The sales of the "fine cut tobacco intended for cigarettes" have therefore been

estimated for 1955-67 (except 1965) on the assumption, derived from figures for the seven earliest years for which both series of figures are available, that "fine cut tobacco intended for cigarettes" was 80.8% of "tobacco for hand-rolled cigarettes and pipe". The resulting figures are given in brackets in table 1.1. These figures were then converted to numbers of handmade cigarettes. Sales of "fine cut tobacco intended for cigarettes" for the years 1982-85, in table 1.1, were converted to numbers of cigarettes on the same basis. Sales of manufactured and handmade cigarettes available for the years 1950-1985 are given in table 1.2. Sales of manufactured cigarettes for years prior to 1950 can be found in Lee (1975). The estimates used in the present analysis have been largely in the form of average consumption of cigarettes per annum or per day for each quinquennium. Statistics of sales of both types of cigarettes on a per annum basis are given in table 1.3 and on a per person aged 15+ per day basis in table 1.4.

1.2 Official surveys of cigarette smoking behaviour

The estimates of cigarette consumption in Canada by sex and age provided in this paper are based on two series of official statistics which reported the results of sample surveys of the smoking behaviour of Canadians. In both series, the survey results were presented in the form of estimates of the numbers or percentages of the population by sex and age who fell into various smoking and non-smoking categories. The results of the first series are to be found in a succession of reports on cigarette smoking behaviour in Canada published by Health and Welfare Canada (namely, Hackland (1976), Promotion and Prevention Directorate (1979), Wheatley (1980), Millar (1983) and Jossa (1985)

supplemented by some previously unpublished statistics in Thompson (1984)). The second series consists of unpublished computer print-outs which have been kindly supplied by Mr. Wayne Millar of Health and Welfare Canada and run off by Mr. Denis Lefebvre of Statistics Canada. Although the figures in both sets of documents have been derived from the same answers to questions on smoking habits included for one month each year in the questionnaires used in the Labour Force Surveys carried out by Statistics Canada, the results have been tabulated using different classifications in the two series. The more detailed analyses contained in the computer print-outs have been used when available but these were available only for 1977, 1979, 1981 and 1983. The less detailed figures of the published series, which covered the years 1964-75, 1977, 1979, 1981 and 1983, have therefore been used for years prior to 1977. The main differences between the analyses provided by the two series are summarised in the following table:

Comparison of published and print-out data

<u>Feature</u>	<u>Published series</u>	<u>Computer print-outs</u>
Years covered	1964-75, 1977, 1979, 1981, 1983	1977, 1979, 1981, 1983
Age groups in analyses	5 groups - viz. 15-19, 20-24, 25-44, 45-64, 65+	8 groups - viz. 15-19, 20-24, 25-34, 35-44, 45-54, 55-64, 65-69, 70+
Types of cigarette smokers covered	Only smokers of manufactured and/or handmade cigarettes	Smokers of manufactured and/or handmade cigarettes, of "usually" manufactured cigarettes and of "usually" handmade cigarettes
Smoking levels per day in analyses	1-10, 11-25, 26+ cigarettes per day	1-15, 16-25, 26+ cigarettes per day

It will be observed that the print-outs provided information on three groups of cigarette smokers - those who smoked manufactured and/or handmade cigarettes, those who "usually" smoked manufactured cigarettes and those who "usually" smoked handmade cigarettes.

1.3 Estimates of cigarette consumption by sex, age and quinquennium using data from official surveys

The next step was to prepare estimates of manufactured and handmade cigarette consumption per person aged 15+ per annum during each of the six quinquennia from 1956-60 to 1981-85, analysed by sex and 8 or 5 age groups, on the basis of the information available from the official sources described in the preceding section of this paper. In the estimates that follow consumption by children aged 14 or less, consumption by occasional cigarette smokers and the net differences between cigarettes purchased by visitors to Canada and cigarettes purchased abroad by residents of Canada have been disregarded as negligible compared with total domestic sales.

As indicated in the preceding section, information on the numbers of cigarettes smoked per day has been presented in the published and print-out data in the form of the numbers or percentages of regular cigarette smokers who had smoked 1-10, 11-25 and 26+ or 1-15, 16-25 and 26+ cigarettes per day. In order to estimate the actual numbers of cigarettes smoked, mean levels of cigarette consumption had to be estimated for each of these two sets of class intervals. The writer has found that such means are frequently required in analyses of statistics of cigarette smoking in different countries and developed a procedure for arriving at estimates of means of class intervals that yielded results which are consistent and appear reasonable. The

procedure is described in Appendix 1. Following this procedure, the means estimated for the two foregoing sets of class intervals were:

	<u>Class intervals</u>			<u>Class intervals</u>		
	<u>1-10</u>	<u>11-25</u>	<u>26+</u>	<u>1-15</u>	<u>16-25</u>	<u>26+</u>
Estimated means -			cigarettes per day			
Males	7.1	18.8	37.0	9.3	20.6	37.0
Females	7.0	18.1	35.7	9.2	20.5	35.7

The detailed procedure adopted in using the results of the official surveys of cigarette smoking behaviour in Canada to provide provisional estimates of cigarette consumption by sex and age for the six quinquennia from 1956-60 to 1981-85 is described in Appendix 2. This procedure showed that the levels of cigarette smoking had been under-reported in all the surveys so that it was necessary to adjust the provisional figures for the percentage of under-reporting that was estimated to have occurred. The estimated percentages of under-reporting are given in table 9. The adjustments made are described in Appendix 2.

1.4 Separation of estimates of manufactured and handmade cigarette consumption per person per day for 1956-60, 1961-65, 1966-70 and 1971-75

Separate estimates of manufactured and handmade cigarette consumption for 1976-80 and 1981-85 could be based on official statistics and, adjusted for under-reporting are given in table 2.1. The next series of calculations was therefore to split the estimates of combined manufactured and handmade cigarette consumption per person per day, adjusted for under-reporting, for the 1956-60, 1961-65, 1966-70 and 1971-75 quinquennia in table 2.2 between the two types of

cigarettes. The procedure adopted was, firstly, to assume that the relative ratios of handmade cigarette consumption per person per day of the various sex and age groups in each of the four quinquennia had been the same as they were later in 1976-80. The relative ratios had of course first to be compressed from 8 into the 5 age groups used prior to 1977; the consumption rates for the three pairs of age groups that had been merged are shown for each sex in table 2.1. An index of these relative ratios is as follows:

Index of relative ratios of handmade cigarette consumption per person
per day, 1976-80

<u>Age</u>	<u>Males</u>	<u>Females</u>
15-19	0.40	0.23
20-24	0.58	0.32
25-44	0.95	0.67
45-64	2.56	1.03
65+	2.38	0.34
All 15+	1.39	0.63
M+F, 15+		1.00

The estimates of handmade cigarette consumption per person per day by sex and age of the four earlier quinquennia, obtained by multiplying the overall average for the quinquennium by the figures in this table, are given in table 3.2. The corresponding figures for manufactured cigarettes, obtained by deducting the handmade estimates from those of the two types of cigarettes combined, are given in table 3.1.

In order to present a complete picture of the consumption per person per day of manufactured and handmade cigarettes during the six quinquennia, the estimates for 1981-85 and 1976-80 have been included in tables 3.1 and 3.2 respectively.

2. Estimates of cigarette consumption by sex and 12 age groups 1956-85

As stated in the Introduction to this paper, estimates of cigarette consumption were required by 5-year age groups. These were the 11 5-year age groups from 15-19 to 65-69 and a final group aged 70+. The estimates available for manufactured and handmade cigarettes in tables 3.1 and 3.2 are for 8 age groups for the two quinquennia 1976-80 and 1981-85 and for 5 age groups for the four quinquennia from 1956-60 to 1971-75. It was therefore necessary to construct models with 12 age groups for each quinquennium from the estimates available for 8 or 5 age groups.

Mrs.B.A.Forey considered several possible models for manufactured and handmade cigarette consumption. For manufactured cigarettes, the equation used was:

$$\log(\text{consumption}) = \text{cubic function of } r$$

where r was the mid-point of the age range.

For the 8-point data, the curve was fitted for males and females separately to the mid-points of the 6 age ranges: 20-24, 25-34, 35-44, 45-54, 55-64, 65-69. This was achieved within GLIM, the computer package used, by giving a weighting of 1 to the points to be included in the fit, and a weighting of 0 to the points excluded (in this case 15-19, 70+). The equations thus obtained were used to predict consumption values for the 5-year age ranges 25-29, 30-34, 35-39, 40-44, 45-49, 50-54, 55-59, 60-64 by substituting r = mid-point of these ranges. These predictions were then combined with the original data for the age ranges 15-19, 20-24, 65-69 and 70+. Total consumption was then calculated for both sexes and all ages and all values were

adjusted to match the known overall consumption.

The procedure was similar for the 5-point data, with the equation fitted to the age ranges 20-24, 25-44, 45-64, 65+, then used to predict consumption values for 25-29, 30-34 60-64, 65-69, 70+. These were then combined with the original data for 15-19, 20-24 and adjusted so as to be consistent with overall consumption. The estimates for all 12 age groups are given in table 4.1 and the coefficients of the fitted curves in table 4.3.

For handmade cigarette consumption, Mrs.Forey concluded that a straightforward log-cubic model gave the most satisfactory results. The estimates for the 12 age groups are given in table 4.2 and the coefficients of the fitted curves in table 4.4.

3. Estimates of manufactured cigarette consumption by sex and 12 age groups during the 1921-25 to 1951-55 quinquennia

In preparing estimates of manufactured cigarette consumption by sex and 12 age groups for the seven quinquennia from 1921-25 to 1951-55 which would link with the estimates for the six quinquennia from 1956-60 to 1981-85, two major requirements immediately arose. The first was to find a basis for splitting total manufactured cigarette consumption between men and women since smoking by the two sexes clearly had different trends during the 35 years from 1921 to 1956. The second requirement was to find a basis for splitting total consumption by each sex between the 12 age groups.

No statistics and few reasonably certain facts are available about the trends in manufactured cigarette consumption by each sex between 1921 and 1956. Nevertheless, certain general impressions can be formed with what should be reasonable accuracy and serve a useful purpose in that estimates which are not consistent with these impressions should be discarded. Further, total sales of manufactured cigarettes are known, so that estimates of cigarette consumption by women always have implications on the balance of consumption attributable to men. One would not expect, for example, during a period when total cigarette consumption per person was decreasing, as it did during the years of the great depression that started in 1929, that cigarette smoking by women would have increased very substantially if at all.

The first point of importance, however, is that, as far as is known, only rarely have persons of either sex ever started to smoke regularly for the first time after they had reached the age of 40, and some would put the age much lower than this. When women older than 40 are found who smoked regularly, they would almost invariably have

started smoking at a younger age and carried the habit with them into middle or old age. In the early 1920's, women over 40 in Canada who regularly smoked manufactured cigarettes would therefore have been rare.

It seems likely that women, and this therefore means women aged about 20 to 39, first started to smoke manufactured cigarettes regularly in Canada during the 1914-18 world war, as they did in the UK and some other countries. After the war, in 1921-25, the habit would have grown among younger women, but in the conditions of the immediate post-war economic depression, consumption by women would hardly have grown rapidly in terms of the number of cigarettes smoked. While the prevalence of the habit and average level of consumption per person doubtless increased during the middle and late 1920's, the great depression that started in 1929 would again have discouraged any large increase in consumption. The cohorts of women who reached their early 20's early in the 1930's would have produced their proportion of new smokers, and probably an increase over the percentages at the same age of earlier cohorts as the habit spread, but the level of consumption per female cigarette smoker may have declined as a result of the depression. On balance, however, the total number of cigarettes smoked by women would probably have increased. Subsequently, as Canada and the world emerged from the depression in the later 1930's cigarette smoking by women would have increased from its relatively small base, but would still have been the habit of a minority of even younger women. On the other hand, in the years following the end of the second world war, cigarette smoking by women had become an important and rapidly expanding habit. It is clear from these contrasts of

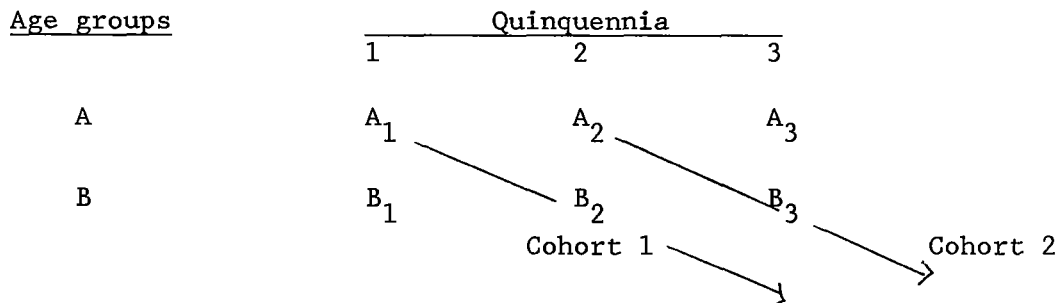
impressions before and after the war that smoking by women, although unrecorded, must have increased very rapidly during the war years. This rapid expansion in female cigarette consumption would have continued, though probably at a declining rate of increase until 1964, when official estimates of smoking by women first became available.

Various estimates of the trends in manufactured cigarette consumption by women in Canada can be made which are consistent both with these impressions and with the total sales of cigarettes. The trends in total sales have always been more affected by factors affecting sales to men than to women but to a decreasing extent as the years passed. The trends in sales of cigarettes per person 15+ per day to men and women from 1921 to 1960 which have been adopted as working hypotheses in this paper are given in table 5. No more is claimed for these figures than that they are consistent with the general impressions that have been summarised above. The preparation of separate estimates per person for male and female cigarette smokers enables estimates of the total numbers of manufactured cigarettes smoked by each sex during the seven quinquennia from 1921-25 to 1951-55 to be calculated. These are included in table 5.

As mentioned above, cigarette smoking by women in Canada would have spread into age groups older than 39 only in so far as women who had started smoking at younger ages grew older. So, in extrapolating backwards from the estimates of 1956-60, estimates of cigarette consumption by women aged 70+ in 1951-55 were treated as negligible and effectively zero. In 1921-25 such women would have been aged 40+ and probably too old ever to have started regular cigarette smoking. In 1946-50, women aged 65+ were excluded from the estimates, and so on,

the lowest age group being excluded in each successive earlier quinquennium.

Apart from these special cases, cigarette consumption by all except the oldest of the age groups has been extrapolated backwards on the assumption that, in neighbouring cohorts, the ratios of the levels of cigarette consumption in the same two adjacent age groups was equal. As an example the ratio of the level of cigarette consumption per person in the 40-44 age group to that of the 45-49 age group in the cohort of men born during the years 1906-10 is assumed to have been equal to the corresponding ratio in the cohort of men born 1911-15. Or, to express the same fact in more general terms, if we have two adjacent 5-year age groups, A and B, and three successive quinquennia, denoted by the subscripts, 1, 2 and 3, in the following form:



Then A_1 represents the level of cigarette consumption by age group A in quinquennium 1, B_2 represents consumption by the next older age group in the next quinquennium, and correspondingly for the other 4 symbols. A_1 and B_2 are not only in the same cohort 1; B_2 is the level of consumption in quinquennium 2 of the age group whose consumption in quinquennium 1 had been A_1 . Similarly in quinquennium 3, B_3 is the level of consumption of the age group whose consumption in quinquennium 2 had been A_2 . The assumption made here is that $A_1/B_2 = A_2/B_3$ and therefore that A_1 can be calculated from the formula that $A_1 = A_2 B_2 / B_3$.

This assumption that the ratio between the cigarette consumption levels of adjacent age groups of any cohort is equal to the same ratio of the next later cohort enables us to carry estimates backwards in a linked series from the earliest quinquennium for which reliable estimates are available to still earlier quinquennia. There is only one age group for which an estimate is not provided by this procedure. This is, in the notation of the example above, age group B_1 when it is the oldest age group (i.e. initially the 70+ age group). The consumption of this age group has been estimated by the formula that

$$B_1 = B_2 \frac{B_2}{B_3}$$

When the consumption levels of all sex and age groups of a quinquennium have been estimated, the sum of the population-weighted annual consumption levels of all sex and age groups was compared with the national annual average manufactured cigarette sales of the quinquennium and the estimates adjusted in equal proportions to be consistent with the national total. The final estimates of manufactured cigarette consumption per person aged 15+ per day, corrected for under-reporting and reconciled with national consumption data, by sex and 12 age groups, for the 13 quinquennia from 1921-25 to 1981-85, are given in table 6.

For convenience, the assumption that the ratios between the levels of cigarette consumption per person per day of neighbouring age groups of successive cohorts are equal will be termed the "cohort age-ratio assumption" and the estimates after adjustment to be consistent with total national consumption will be described as obtained by use of the "adjusted cohort age-ratio assumption".

The final estimates are re-arranged by cohorts in table 7. This re-arrangement has had an effect that has to be taken into consideration when using the figures in table 7. The numbers of cigarettes smoked were estimated in the form of the number of cigarettes smoked per person per day in each quinquennium by sex and 5-year age groups. There were therefore a set of pigeon-holes, 5 years x 5 years, into one of which every person aged 15+ was placed. When, however, the levels of cigarette consumption per person were re-arranged to provide estimates by cohorts, the dimensions of the pigeon-holes were unavoidably enlarged. Each pigeon-hole now overlapped its upper and lower neighbour to some extent. An example may make this clearer. In the quinquennium 1976-80, men aged 45-49 had smoked an average of 14.15 manufactured cigarettes per day (table 4.1). Men at the central point of this age group (i.e. those aged 47 in 1978) would have been born in 1931 and this year is the central year of birth of the 1929-33 cohort. Therefore 14.15 cigarettes per day has been taken as the level of consumption of men aged 45-49 in the 1929-33 cohort. But this cohort would have included some men who had been born in 1929 and had reached 45 in 1974 and some men born in 1933 who had reached 49 in 1982, whereas the years covered by the original estimates in table 4.1 had been not 1974-82 but 1976-80. Of course the vast

majority of the cohort would have fallen within the 1976-80 range. On the other hand, if mortality rates of men in 1976-80 were to be re-arranged by cohort exactly the same spread of rates for men 45-49, and correspondingly for other age groups, would occur. The same element of overlap occurs in estimates of handmade cigarette consumption re-arranged by cohort in table 8.

4. How reliable are the estimates in tables 4.1, 4.2 and 6 likely to be?

4.1 Overall accuracy -

1. Manufactured cigarettes

The estimates of manufactured cigarette consumption per person aged 15+ per day in each sex and age group in tables 4.1 and 6 were adjusted so that, when the estimates were weighted by the population in the mid-year of the quinquennium, the overall average consumption of manufactured cigarettes agreed with the national average consumption per person 15+ per day during the quinquennium in table 1.4. The latter averages were based on government statistics of sales of manufactured cigarettes to the distributive trade and official estimates of the population. The averages should therefore have been highly accurate.

2. Handmade cigarettes

The estimates of handmade cigarette consumption per person aged 15+ per day in each sex and age group in table 4.2, were correspondingly adjusted so that, when the estimates were weighted by the population in the mid-year of the quinquennium, the overall average consumption of handmade cigarettes agreed with the estimated national average consumption per person 15+ per day during the quinquennium in table 1.4. The latter averages were based on the assumptions that 100% of the tobacco sales classified as "fine cut tobacco intended for cigarettes" had in fact been so used and that handmade cigarettes had contained an average of 1g of tobacco per cigarette. It is possible that the tobacco used in handmade cigarettes had been slightly less than 100% of "fine cut

tobacco intended for cigarettes" and that the average handmade cigarette had contained less than 1g of tobacco. If both possibilities had occurred, the errors would have partially offset one another.

4.2 Accuracy of estimates of cigarette consumption by sex and age

Since the estimates of overall average consumption of manufactured cigarettes should have been highly accurate and those of handmade cigarettes reasonably accurate, errors in the estimates of consumption by the various sex and age groups will have largely offset one another. In order that the estimates of cigarette consumption by sex and age should be as accurate as possible, they were based on the results of surveys of cigarette smoking behaviour carried out by Statistics Canada through their Labour Force Surveys. The levels of national manufactured and handmade cigarette consumption implied by the results of these surveys fell short of the known or estimated levels of cigarette consumption. The deficiencies can be seen in table 9. While the estimated coverage of the surveys in table 9 is affected by the treatments by the writer of the results of the surveys, it is customary for sample surveys to under-estimate national cigarette consumption.

It therefore became necessary to adjust the survey results in order to bring them into agreement with national totals. For each type of cigarette in recent quinquennia and for both types combined in earlier quinquennia, all estimated consumption levels by each sex and age in a quinquennium had to be multiplied by the same relatively large adjustment factor. Errors in the survey estimates for individual cells would have been correspondingly magnified even although on balance the

errors still offset one another. On the other hand, there are no sex and age estimates that are remarkably out of line with those of neighbouring cells. Nevertheless, differential errors in the figures are likely to exist. In an important paper, Millar (1985) has pointed out that information in surveys provided by proxies on behalf of informants who could not be interviewed was more likely to under-report cigarette consumption than information provided personally by informants, and that proxy responses were more common among men than women and among younger than older cigarette smokers of both sexes. This meant that the estimates of cigarette consumption by men and by younger smokers may still have been under-stated to some extent in the adjusted figures given in the tables of this paper and consumption by women and older smokers over-stated.

4.3 Backward extrapolation of manufactured cigarette consumption

It is essential to consider in some detail the likely accuracy of estimates of manufactured cigarette consumption per person per day by sex and age groups obtained by backward extrapolation using the adjusted cohort age-ratio assumption. In the notation used in the section 3 of this paper, the value of A_1 , the number of cigarettes smoked per person per day by age group A in quinquennium 1, was assumed, before adjustment, to be equal to A_2B_2/B_3 , where B was the next age group older than A and the subscripts 2 and 3 denoted the two quinquennia that followed quinquennium 1. If there had been no factors that had produced a major change in the trends of cigarette consumption during quinquennia 1, 2 and 3, a certain value would have obtained for A_1 . But if there had been, say, a sharp increase in cigarette prices

during the early part of quinquennium 3, then the value of B_3 would have been reduced and the value of A_1 would consequently have been increased. The increase in cigarette prices would, in the circumstances mentioned, have increased all the estimated values - A_1, B_1, C_1, \dots - of quinquennium 1. These values would, of course, have been adjusted in order to bring the total calculated cigarette consumption in quinquennium 1 into agreement with the national tables. Nevertheless, sudden changes in cigarette consumption could have had disturbing effects and have had different effects on different age groups. In addition, of course, all the consumption estimates were subject to random variations.

In order to have some idea of the magnitude of the errors likely to have been introduced by using the adjusted cohort age-ratio assumption, two tests were made. First, using this assumption, estimates of manufactured cigarette consumption per person per day by sex and 5-year age groups were calculated for 1971-75 by backward extrapolation from the data for 1976-80 and 1981-85 and compared in table 10 section A with those for 1971-75 in table 4.1 that had been based on print-outs supplied by Health and Welfare Canada. Secondly, to provide a test of this assumption over a slightly longer period, consumption levels were calculated for 1956-60 by extrapolating backwards from the estimates in table 4.1 for 1966-70 and 1971-75. The resulting estimates for 1956-60 are compared in table 10 section B with those in table 4.1 based ultimately on figures published by Health and Welfare, Canada. In these relatively short periods the errors due to the use of the adjusted cohort age-ratio assumption were within satisfactory limits except in the oldest male age group and the five oldest female age groups where the numbers of smokers would have been smallest and the sampling errors largest.

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Table 1.1

Sales of (1) "tobacco for hand-rolled cigarettes and pipe",
 (2) "fine cut tobacco intended for cigarettes" and
 (3) "other cut tobacco"

<u>Year</u>	<u>Tobacco for hand-rolled cigarettes and pipe</u> million kg.	<u>Fine cut tobacco intended for cigarettes</u> million kg.	<u>Other cut tobacco</u>
1950	11.7		
51	12.4		
52	14.1		
53	11.8		
54	11.1		
1955	10.7	(8.6)	
56	9.6	(7.8)	
57	9.4	(7.6)	
58	9.9	(8.0)	
59	10.2	(8.2)	
1960	10.3	(8.3)	
61	10.4	(8.4)	
62	10.6	(8.6)	
63	10.1	(8.2)	
64	9.6	(7.8)	
1965	10.0	8.2	
66	8.7	(7.0)	
67	8.2	(6.6)	
68	8.8	7.0	
69	8.6	6.8	
1970	8.6	6.9	
71	8.9	7.2	
72	8.7	7.0	
		<u>000 kg</u>	<u>000 kg</u>
73	8.9	7,363	638
74		6,706	600
1975		6,759	953
76		6,577	924
77		6,313	865
78		5,660	856
79		5,227	813
1980		4,785	691
81		4,765	721
82		5,552	309
83		6,023	292
84		6,166	250
1985		6,866	192

Table 1.1 (continued)

Sales of (1) "tobacco for hand-rolled cigarettes and pipe",
(2) "fine cut tobacco intended for cigarettes" and
(3) "other cut tobacco"

Sources: Tobacco for hand-rolled cigarettes and pipe from Lee (1975) pp.18-19 converted to kg.

Fine cut tobacco intended for cigarettes - 1965 and 1968-72 calculated from number of handmade cigarettes in Millar (1983) tables 47 and 48; for 1973-84 from Canadian Statistical Review, converted to kg.

Other cut tobacco - from Canadian Statistical Review, converted to kg.

Notes: 1. Sales of plug tobacco were not included in those of "tobacco for hand-rolled cigarettes and pipe".

2. In 1975 "other cut tobacco" included smoking, chewing and twist tobacco; in 1985 it included pipe, plug, chewing and twist tobacco and snuff, etc.

Table 1.2

Sales of manufactured cigarettes and estimated consumption of
handmade cigarettes and of both types of cigarettes

<u>Year</u>	<u>Manufactured cigarettes</u> millions	<u>Handmade cigarettes</u> millions	<u>Manufactured and handmade cigarettes</u> millions
1950	17,172		
51	15,672		
52	17,844		
53	21,000		
54	22,116		
1955	24,576	(8,600)	33,200
56	27,000	(7,800)	34,800
57	30,144	(7,600)	37,700
58	32,404	(8,000)	40,400
59	33,822	(8,200)	42,000
1960	34,289	(8,300)	42,600
61	36,699	(8,400)	45,100
62	38,683	(8,600)	47,300
63	39,877	(8,200)	48,100
64	40,639	(7,800)	48,400
1965	43,013	8,160	51,173
66	46,276	(7,000)	53,300
67	46,864	(6,600)	53,500
68	46,270	7,021	53,291
69	46,582	6,817	53,400
1970	49,823	6,922	56,744
71	50,864	7,189	58,053
72	53,292	6,974	60,266
73	54,864	7,359	62,223
74	57,123	6,705	63,828
1975	57,756	6,710 (?6,759)	64,466
76	60,745	6,575	67,320
77	61,787	6,315	68,102
78	61,610	5,659	67,269
79	63,866	5,227	69,092
1980	64,492	4,783	69,275
81	66,559	4,764	71,323
82	66,339	(5,552)	71,891
83	63,115	(6,023)	69,138
84	61,734	(6,166)	67,900
1985	58,954	(6,866)	65,820

Table 1.2 (continued)

Sales of manufactured cigarettes and estimated consumption of
handmade cigarettes and of both types of cigarettes

Sources: Manufactured cigarettes - 1950-67 from Lee (1975) p.19; 1968-81 from Millar (1983) table 47; 1982-85 from Canadian Statistical Review.

Handmade cigarettes - Figures not in brackets from Millar (1983) table 47. Figures in brackets calculated by the writer as described in the text. These figures from 1955 to 1967 were estimated only to nearest 100 million because sales of "tobacco for hand-rolled cigarettes and pipe" in table 1.1 were available only to nearest 100,000 lbs.

Note: Sales of "fine cut tobacco intended for cigarettes" in 1975 were 6,759,000 kg. (table 1.1)

Table 1.3

Consumption of manufactured and handmade cigarettes:
totals and averages per annum of each quinquennium

<u>Quinquennium</u>	<u>Manufactured cigarettes</u>		<u>Handmade cigarettes</u>		<u>Both types combined</u>	
	<u>Total</u>	<u>per annum</u>	<u>Total</u>	<u>per annum</u>	<u>Total</u>	<u>per annum</u>
				millions		
1956-60	157,659	31,532	39,900	7,980	197,500	39,500
1961-65	198,911	39,782	41,160	8,232	240,073	48,015
1966-70	235,815	47,163	34,360	6,872	270,235	54,047
1971-75	273,899	54,780	34,937	6,987	308,836	61,767
1976-80	312,500	62,500	28,559	5,712	341,058	68,212
1981-85	316,701	63,340	29,371	5,874	346,072	69,214

Source: Based on table 1.2

Note: The totals do not add across exactly for early quinquennia owing to rounding of the estimates for handmade cigarettes

Table 1.4

Consumption of manufactured and handmade cigarettes:
average consumption per person (males + females)
aged 15+ per day per quinquennium

<u>Quinquennium</u>	<u>Manufactured cigarettes</u>	<u>Handmade cigarettes</u> cigarettes per day	<u>Both types combined</u>
1958-60	7.58	1.92	9.50
1961-65	8.71	1.80	10.51
1966-70	9.13	1.33	10.47
1971-75	9.43	1.20	10.63
1976-80	9.62	0.88	10.50
1981-85	8.93	0.83	9.76

Source: Based on table 1.3

Table 2.1

Estimates of manufactured and handmade cigarette consumption per person per day by sex and age, adjusted for under-reporting, 1981-85 and 1976-80

	1981-85		1976-80	
	<u>Manufactured cigarettes</u>	<u>Handmade cigarettes</u>	<u>Manufactured cigarettes</u>	<u>Handmade cigarettes</u>
<u>Males</u>				
15-19	4.67	0.48	6.27	0.35
20-24	10.25	0.37	11.95	0.51
25-34	12.11	0.80	14.08)	0.71)
35-44	13.50	0.97	)14.29	)0.84
45-54	12.64	1.68	14.59)	1.02)
55-64	9.26	1.99	13.20)	2.13)
65-69	6.67	1.30	)12.10	)2.25
70+	4.60	1.40	10.70)	2.40)
All 15+	10.32	1.08	7.06)	2.68)
			) 5.37	)2.09
			4.29)	1.71)
			11.42	1.22
<u>Females</u>				
15-19	4.22	0.32	5.55	0.20
20-24	9.55	0.45	10.30	0.28
25-34	9.70	0.63	10.21)	0.41)
35-44	9.39	0.86	) 9.91	)0.59
45-54	8.76	0.93	9.49)	0.85)
55-64	6.34	0.71	8.64)	0.85)
65-69	3.91	0.28	) 7.52	)0.91
70+	2.43	0.06	6.21)	0.97)
All 15+	7.59	0.58	4.21)	0:57)
			) 2.40	)0.30
			1.47)	0.16)
M + F, 15+	8.93	0.83	7.84	0.55
			9.62	0.88

Table 2.2

Estimates of combined manufactured and handmade cigarette consumption per person per day by sex and age, adjusted for under-reporting, 1971-75, 1966-70, 1961-65 and 1956-60

<u>Sex and age</u>	<u>1971-75</u>	<u>1966-70</u>	<u>1961-65</u>	<u>1956-60</u>
<u>Males</u>				
15-19	7.63	6.95	7.44	6.69
20-24	14.11	14.77	15.24	13.71
25-44	15.93	16.85	17.40	15.65
45-64	15.34	15.08	16.03	14.42
65+	8.04	7.69	7.60	6.83
All 15+	13.56	13.77	14.41	12.96
<u>Females</u>				
15-19	5.81	3.87	3.41	3.07
20-24	9.82	9.60	8.95	8.05
25-44	9.79	9.67	9.01	8.11
45-64	7.87	7.03	6.27	5.64
65+	2.40	1.72	1.42	1.27
All 15+	7.80	7.22	6.68	6.00
M + F, 15+	10.63	10.47	10.51	9.50

Table 3.1

Estimates of manufactured cigarette consumption per person
15+ per day, adjusted for under-reporting, by sex and age,
1956-60 to 1981-85

	<u>1981-85</u>	<u>1976-80</u>	<u>1971-75</u>	<u>1966-70</u>	<u>1961-65</u>	<u>1956-60</u>
	cigarettes per day					
<u>Males</u>						
15-19	4.67	6.27	7.15	6.42	6.72	5.92
20-24	10.25	11.95	13.41	14.00	14.20	12.60
25-34	12.11	14.08)				
		)14.29	14.79	15.59	15.69	13.83
35-44	13.50	14.59)				
45-54	12.64	13.20)				
		)12.10	12.27	11.68	11.42	9.50
55-64	9.26	10.70)				
65-69	6.67	7.06)				
		) 5.37	5.18	4.52	3.32	2.26
70+	4.60	4.29)				
All 15+	10.32	11.42	11.89	11.92	11.91	10.29
<u>Females</u>						
15-19	4.22	5.55	5.53	3.56	3.00	2.63
20-24	9.55	10.30	9.44	9.17	8.37	7.44
25-34	9.70	10.21)				
		) 9.91	8.99	8.78	7.80	6.82
35-44	9.39	9.49)				
45-54	8.76	8.64)				
		) 7.52	6.63	5.66	4.42	3.66
55-64	6.34	6.21)				
65-69	3.91	4.21)				
		) 2.40	1.99	1.27	0.81	0.62
70+	2.43	1.47)				
All 15+	7.59	7.84	7.04	6.38	5.55	4.79
M+F, 15+	8.93	9.62	9.43	9.14	8.71	7.58

Table 3.2

Estimates of handmade cigarette consumption per person
15+ per day, adjusted for under-reporting, by sex and age,
1956-60 to 1981-85

	<u>1981-85</u>	<u>1976-80</u>	<u>1971-75</u>	<u>1966-70</u>	<u>1961-65</u>	<u>1956-60</u>
	cigarettes per day					
<u>Males</u>						
15-19	0.48	0.35	0.48	0.53	0.72	0.77
20-24	0.37	0.51	0.70	0.77	1.04	1.11
25-34	0.80	0.71)				
35-44	0.97	)0.84	1.14	1.26	1.71	1.82
45-54	1.68	1.02)				
55-64	1.99	)2.25	3.07	3.40	4.61	4.92
65-69	1.30	2.40)				
70+	1.40	)2.09	2.86	3.17	4.28	4.57
All 15+	1.08	1.71)	1.67	1.85	2.50	2.67
<u>Females</u>						
15-19	0.32	0.20	0.28	0.31	0.41	0.44
20-24	0.45	0.28	0.38	0.43	0.58	0.61
25-34	0.63	0.41)				
35-44	0.86	)0.59	0.80	0.89	1.21	1.29
45-54	0.93	0.86)				
55-64	0.71	)0.91	1.24	1.37	1.85	1.98
65-69	0.28	0.97)				
70+	0.06	)0.30	0.41	0.45	0.61	0.65
All 15+	0.58	0.16)	0.76	0.84	1.13	1.21
M+F, 15+	0.83	0.55	1.20	1.33	1.80	1.92

Table 4.1

Estimates of manufactured cigarette consumption per person per day
by sex and 12 age groups during quinquennia 1956-60 to 1981-85

	<u>1956-60</u>	<u>1961-65</u>	<u>1966-70</u>	<u>1971-75</u>	<u>1976-80</u>	<u>1981-85</u>
	cigarettes per day					
<u>Males</u>						
15-19	5.96	6.71	6.50	7.28	6.30	4.68
20-24	12.68	14.19	14.18	13.66	12.00	10.27
25-29	13.17	14.80	14.98	14.21	13.28	11.64
30-34	13.72	15.43	15.61	14.81	14.18	12.75
35-39	14.03	15.81	15.86	15.22	14.71	13.40
40-44	13.78	15.60	15.56	15.24	14.72	13.49
45-49	12.72	14.57	14.58	14.66	14.15	12.96
50-54	10.79	12.65	12.90	13.38	12.99	11.87
55-59	8.23	10.02	10.66	11.42	11.32	10.32
60-64	5.52	7.10	8.14	8.99	9.32	8.51
65-69	3.19	4.43	5.69	6.45	7.09	6.69
<u>70+</u>	<u>0.56</u>	<u>0.99</u>	<u>1.90</u>	<u>2.24</u>	<u>4.31</u>	<u>4.61</u>
All 15+	10.27	11.92	11.93	11.85	11.28	10.32
<u>Females</u>						
15-19	2.65	3.00	3.61	5.63	5.58	4.23
20-24	7.49	8.36	9.29	9.62	10.35	9.57
25-29	7.16	8.16	9.01	9.24	10.20	9.53
30-34	6.98	8.05	8.94	9.15	10.06	9.58
35-39	6.73	7.88	8.85	9.13	9.87	9.62
40-44	6.25	7.46	8.51	8.95	9.53	9.51
45-49	5.45	6.64	7.76	8.41	8.94	9.10
50-54	4.32	5.41	6.52	7.41	8.08	8.28
55-59	3.05	3.93	4.93	5.98	6.94	7.06
60-64	1.85	2.47	3.26	4.30	5.62	5.54
65-69	0.94	1.31	1.84	2.70	4.23	3.92
<u>70+</u>	<u>0.11</u>	<u>0.18</u>	<u>0.29</u>	<u>0.59</u>	<u>1.48</u>	<u>2.44</u>
All 15+	4.84	5.50	6.37	7.06	8.01	7.59
M+F, 15+	7.58	8.71	9.14	9.43	9.62	8.93

Table 4.2

Estimates of handmade cigarette consumption per person per day
by sex and 12 age groups during quinquennia 1956-60 to 1981-85

	<u>1956-60</u>	<u>1961-65</u>	<u>1966-70</u>	<u>1971-75</u>	<u>1976-80</u>	<u>1981-85</u>
	cigarettes per day					
<u>Males</u>						
15-19	0.86	0.68	0.59	0.54	0.38	0.45
20-24	1.06	0.85	0.73	0.67	0.47	0.56
25-29	1.35	1.12	0.94	0.86	0.60	0.70
30-34	1.78	1.52	1.23	1.12	0.79	0.87
35-39	2.35	2.07	1.63	1.48	1.04	1.08
40-44	3.07	2.81	2.12	1.93	1.36	1.30
45-49	3.89	3.72	2.69	2.44	1.73	1.53
50-54	4.70	4.72	3.24	2.95	2.11	1.74
55-59	5.32	5.64	3.67	3.33	2.44	1.90
60-64	5.55	6.24	3.83	3.48	2.63	1.96
65-69	5.22	6.26	3.62	3.29	2.58	1.91
<u>70+</u>	<u>3.07</u>	<u>4.28</u>	<u>2.15</u>	<u>1.95</u>	<u>1.75</u>	<u>1.43</u>
All 15+	2.67	2.50	1.85	1.67	1.22	1.08
<u>Females</u>						
15-19	0.47	0.36	0.33	0.30	0.20	0.37
20-24	0.64	0.49	0.44	0.40	0.27	0.48
25-29	0.88	0.68	0.61	0.55	0.38	0.62
30-34	1.19	0.92	0.82	0.74	0.51	0.79
35-39	1.55	1.20	1.07	0.97	0.67	0.94
40-44	1.90	1.47	1.30	1.19	0.83	1.05
45-49	2.14	1.65	1.47	1.35	0.96	1.08
50-54	2.17	1.66	1.48	1.37	1.02	1.00
55-59	1.92	1.47	1.32	1.22	0.96	0.82
60-64	1.46	1.12	1.00	0.93	0.80	0.58
65-69	0.92	0.71	0.63	0.59	0.58	0.35
<u>70+</u>	<u>0.18</u>	<u>0.14</u>	<u>0.12</u>	<u>0.11</u>	<u>0.16</u>	<u>0.07</u>
All 15+	1.21	1.13	0.84	0.76	0.55	0.58
M+F, 15+	1.92	1.80	1.33	1.20	0.88	0.83

Table 4.3

Manufactured cigarette consumption in Canada

Estimates of coefficients of curves fitted to table 3.1
by a partial log-cubic weighted method

by Mrs. B.A. Forey

		Constant	a	2 a	3 a
1981-85	M	1.356	.05667	-.0005061	-.000003293
	F	2.933	-.06638	.002120	-.00002206
1976-80	M	1.957	.02514	.0001276	-.000007464
	F	2.759	-.04054	.001291	-.00001463
1971-75	M	2.760	-.03077	.001451	-.00001784
	F	3.381	-.1061	.003178	-.00003177
1966-70	M	2.510	-.006830	.0008959	-.00001446
	F	3.299	-.1047	.003289	-.00003475
1961-65	M	2.935	-.04467	.001988	-.00002453
	F	3.216	-.1051	.003320	-.00003622
1956-60	M	2.969	-.05940	.002445	-.00002930
	F	3.119	-.1063	.003345	-.00003683

Table 4.4

Handmade cigarette consumption in Canada

Estimates of coefficients of curves fitted to table 3.2
by log-cubic method

by Mrs. B.A. Forey

		Constant	a	² a	³ a
1981-85	M	-1.491	.02311	.0008433	-.00001100
	F	-1.875	.02799	.001409	-.00002491
1976-80	M	-1.222	-.01591	.002119	-.00002088
	F	-2.343	.01962	.001843	-.00002594
1971-75	M	-0.8648	-.02135	.002307	-.00002304
	F	-1.852	.002519	.002418	-.00003245
1966-70	M	-0.7596	-.02212	.002330	-.00002322
	F	-1.797	.007493	.002291	-.00003153
1961-65	M	-0.4413	-.02346	.002367	-.00002354
	F	-1.623	.01703	.002076	-.00003003
1956-60	M	-0.3554	-.02511	.002404	-.00002378
	F	-1.499	.01144	.002221	-.00003115

Table 5

Manufactured cigarette consumption per quinquennium:
estimated or assumed consumption per person 15+
of each sex per day and consequential split of average
national cigarette consumption per annum

<u>Quinquennium</u>	<u>Cigarettes per person</u> <u>15+ per day</u>			<u>National consumption</u> <u>per annum</u>		
	<u>Males</u>	<u>Females</u>	<u>M+F</u>	<u>Males</u>	<u>Females</u>	<u>M+F</u>
	<u>cigarettes</u>			<u>million cigarettes</u>		
1921-25	2.60	0.10	1.12	2317	105	2422
1926-30	3.16	0.30	1.78	3961	351	4312
1931-35	2.88	0.40	1.69	4026	512	4538
1936-40	3.76	0.80	2.33	5654	1120	6774
1941-45	5.57	1.50	3.59	8928	2274	11202
1946-50	6.51	3.00	4.78	11050	4924	15974
1951-55	7.32	3.50	5.43	13783	6459	20242
1956-60	10.27	4.84	7.58	21560	9972	31532
1961-65	11.92	5.50	8.71	27235	12547	39782
1966-70	11.93	6.37	9.14	30624	16539	47163
1971-75	11.85	7.06	9.43	34089	20691	54780
1976-80	11.28	8.01	9.62	36069	26431	62500
1981-85	10.32	7.59	8.93	35869	27471	63340

Note: Numbers of cigarettes smoked per female 15+ per day from 1921 to 1950 are assumed levels of consumption; later figures were estimated as described in the text.

Table 6

Estimates of manufactured cigarette consumption per person per day by sex and 12 age groups during quinquennia 1921-25 to 1951-55

	<u>1921-25</u>	<u>1926-30</u>	<u>1931-35</u>	<u>1936-40</u>	<u>1941-45</u>	<u>1946-50</u>	<u>1951-55</u>
<u>Males</u>							
15-19	2.73	2.87	2.29	2.72	3.71	4.08	4.36
20-24	5.38	5.85	4.78	5.72	7.84	8.64	9.24
25-29	4.87	5.61	4.75	5.83	8.08	8.95	9.59
30-34	4.09	5.10	4.57	5.82	8.26	9.26	9.97
35-39	2.65	4.21	4.09	5.51	8.12	9.31	10.14
40-44	1.69	2.65	3.27	4.77	7.42	8.83	9.85
45-49	1.00	1.60	1.95	3.62	6.10	7.67	8.88
50-54	0.57	0.89	1.10	2.03	4.36	5.93	7.25
55-59	0.30	0.47	0.57	1.07	2.29	3.97	5.24
60-64	0.13	0.23	0.28	0.51	1.11	1.93	3.25
65-69	0.07	0.09	0.12	0.23	0.49	0.87	1.47
<u>70+</u>	<u>0.02</u>	<u>0.02</u>	<u>0.02</u>	<u>0.04</u>	<u>0.09</u>	<u>0.15</u>	<u>0.26</u>
All 15+	2.60	3.16	2.88	3.76	5.57	6.51	7.32
<u>Females</u>							
15-19	0.10	0.25	0.30	0.56	0.97	1.80	1.98
20-24	0.24	0.65	0.80	1.49	2.62	4.95	5.50
25-29	0.20	0.55	0.70	1.35	2.40	4.61	5.20
30-34	0.16	0.46	0.61	1.21	2.22	4.34	4.99
35-39	0.12	0.38	0.51	1.06	2.00	4.03	4.72
40-44	-	0.27	0.41	0.88	1.72	3.56	4.30
45-49	-	-	0.27	0.67	1.36	2.93	3.64
50-54	-	-	-	0.41	0.97	2.17	2.80
55-59	-	-	-	-	0.54	1.43	1.91
60-64	-	-	-	-	-	0.71	1.11
65-69	-	-	-	-	-	-	0.48
<u>70+</u>	<u>-</u>	<u>-</u>	<u>-</u>	<u>-</u>	<u>-</u>	<u>-</u>	<u>-</u>
All 15+	0.10	0.30	0.40	0.83	1.50	3.00	3.50
M+F, 15+	1.12	1.78	1.69	2.33	3.59	4.78	5.43

Table 7

Estimates of manufactured cigarette consumption per person
per day in tables 4.1 and 6 arranged by cohorts of each sex

<u>Age</u>	<u>Cohort years of birth</u>							
	<u>1854-58</u>	<u>1859-63</u>	<u>1864-68</u>	<u>1869-73</u>	<u>1874-78</u>	<u>1879-83</u>	<u>1884-88</u>	<u>1889-93</u>
	<u>Males</u>							
15-19	-	-	-	-	-	-	-	-
20-24	-	-	-	-	-	-	-	-
25-29	-	-	-	-	-	-	-	-
30-34	-	-	-	-	-	-	-	-
35-39	-	-	-	-	-	-	-	4.09
40-44	-	-	-	-	-	-	2.65	4.21
45-49	-	-	-	-	1.00	1.69	2.65	3.27
50-54	-	-	-	0.57	0.89	1.60	1.95	3.62
55-59	-	-	0.30	0.47	0.57	1.10	2.03	4.36
60-64	-	0.13	0.23	0.28	0.51	1.07	2.29	3.97
65-69	0.07	0.09	0.12	0.23	0.49	1.11	1.93	3.25
						0.87	1.47	3.19
	<u>Females</u>							
15-19						-	-	-
20-24						-	-	-
25-29						-	-	-
30-34						-	-	-
35-39						-	-	0.16
40-44						-	0.12	0.38
45-49						-	0.27	0.41
50-54						-	0.27	0.67
55-59						-	0.41	0.97
60-64						-	0.54	1.43
65-69						-	0.71	1.11
						-	0.48	0.94

Table 7 (contd)

Estimates of manufactured cigarette consumption per person per day in tables 4.1 and 6 arranged by cohorts of each sex

<u>Age</u>	<u>Cohort years of birth</u>							
	<u>1894-98</u>	<u>1899-03</u>	<u>1904-08</u>	<u>1909-13</u>	<u>1914-18</u>	<u>1919-23</u>	<u>1924-28</u>	<u>1929-33</u>
	<u>Males</u>							
15-19	-	-	2.73	2.87	2.29	2.72	3.71	4.08
20-24	-	5.38	5.85	4.78	5.72	7.84	8.64	9.24
25-29	4.87	5.61	4.75	5.83	8.08	8.95	9.95	13.17
30-34	5.10	4.57	5.82	8.26	9.26	9.97	13.72	15.43
35-39	4.09	5.51	8.12	9.31	10.14	14.03	15.81	15.86
40-44	4.77	7.42	8.83	9.85	13.78	15.60	15.56	15.24
45-49	6.10	7.67	8.88	12.72	14.57	14.58	14.66	14.15
50-54	5.93	7.25	10.79	12.65	12.90	13.38	12.99	11.87
55-59	5.24	8.23	10.02	10.66	11.42	11.32	10.32	-
60-64	5.52	7.10	8.14	8.99	9.32	8.51	-	-
65-69	4.43	5.69	6.45	7.09	6.69	-	-	-
	<u>Females</u>							
15-19	-	-	0.11	0.27	0.30	0.56	0.97	1.80
20-24	-	0.24	0.65	0.80	1.49	2.62	4.95	5.50
25-29	0.20	0.55	0.70	1.35	2.40	4.61	5.20	7.16
30-34	0.46	0.61	1.21	2.22	4.34	4.99	6.98	8.05
35-39	0.51	1.06	2.00	4.03	4.72	6.73	7.88	8.85
40-44	0.88	1.72	3.56	4.30	6.25	7.46	8.51	8.95
45-49	1.36	2.93	3.64	5.45	6.64	7.76	8.41	8.94
50-54	2.17	2.80	4.32	5.41	6.52	7.41	8.08	8.28
55-59	1.91	3.05	3.93	4.93	5.98	6.94	7.06	-
60-64	1.85	2.47	3.26	4.30	5.62	5.54	-	-
65-69	1.31	1.84	2.70	4.23	3.92	-	-	-

Table 7 (contd)

Estimates of manufactured cigarette consumption per person per day in tables 4.1 and 6 arranged by cohorts of each sex

<u>Age</u>	<u>Cohort years of birth</u>						
	<u>1934-38</u>	<u>1939-43</u>	<u>1944-48</u>	<u>1949-53</u>	<u>1954-58</u>	<u>1959-63</u>	<u>1964-68</u>
	<u>Males</u>						
15-19	4.36	5.96	6.71	6.50	7.28	6.30	4.68
20-24	12.68	14.19	14.18	13.66	12.00	10.27	-
25-29	14.80	14.98	14.21	13.28	11.64	-	-
30-34	15.61	14.81	14.18	12.75	-	-	-
35-39	15.22	14.71	13.40	-	-	-	-
40-44	14.72	13.49	-	-	-	-	-
45-49	12.96	-	-	-	-	-	-
50-54	-	-	-	-	-	-	-
55-59	-	-	-	-	-	-	-
60-64	-	-	-	-	-	-	-
65-69	-	-	-	-	-	-	-
	<u>Females</u>						
15-19	1.98	2.65	3.00	3.61	5.63	5.58	4.23
20-24	7.49	8.36	9.29	9.62	10.35	9.57	-
25-29	8.16	9.01	9.24	10.20	9.53	-	-
30-34	8.94	9.15	10.06	9.58	-	-	-
35-39	9.13	9.87	9.62	-	-	-	-
40-44	9.53	9.51	-	-	-	-	-
45-49	9.10	-	-	-	-	-	-
50-54	-	-	-	-	-	-	-
55-59	-	-	-	-	-	-	-
60-64	-	-	-	-	-	-	-
65-69	-	-	-	-	-	-	-

Table 8

Estimates of handmade cigarette consumption per person per day in table 4.2 arranged by cohorts of each sex

<u>Age</u>	<u>Cohort years of birth</u>					
	<u>1889-93</u>	<u>1894-98</u>	<u>1899-1903</u>	<u>1904-08</u>	<u>1909-13</u>	<u>1914-18</u>
	<u>Males</u>					
15-19	-	-	-	-	-	-
20-24	-	-	-	-	-	-
25-29	-	-	-	-	-	-
30-34	-	-	-	-	-	-
35-39	-	-	-	-	-	-
40-44	-	-	-	-	-	3.07
45-49	-	-	-	-	3.89	3.72
50-54	-	-	-	4.70	4.72	3.24
55-59	-	-	5.32	5.64	3.67	3.33
60-64	-	5.55	6.24	3.83	3.48	2.63
65-69	5.22	6.26	3.62	3.29	2.58	1.91
	<u>Females</u>					
15-19	-	-	-	-	-	-
20-24	-	-	-	-	-	-
25-29	-	-	-	-	-	-
30-34	-	-	-	-	-	-
35-39	-	-	-	-	-	-
40-44	-	-	-	-	-	1.90
45-49	-	-	-	-	2.14	1.65
50-54	-	-	-	2.17	1.66	1.48
55-59	-	-	1.92	1.47	1.32	1.22
60-64	-	1.46	1.12	1.00	0.93	0.80
65-69	0.92	0.71	0.63	0.59	0.58	0.35

Table 8 (contd)

Estimates of handmade cigarette consumption per person
per day in table 4.2 arranged by cohorts of each sex

<u>Age</u>	<u>Cohort years of birth</u>					
	<u>1919-23</u>	<u>1924-28</u>	<u>1929-33</u>	<u>1934-38</u>	<u>1939-43</u>	<u>1944-48</u>
	<u>Males</u>					
15-19	-	-	-	-	0.86	0.68
20-24	-	-	-	1.06	0.85	0.73
25-29	-	-	1.35	1.12	0.94	0.86
30-34	-	1.78	1.52	1.23	1.12	0.79
35-39	2.35	2.07	1.63	1.48	1.04	1.08
40-44	2.81	2.12	1.93	1.36	1.30	-
45-49	2.69	2.44	1.73	1.53	-	-
50-54	2.95	2.11	1.74	-	-	-
55-59	2.44	1.90	-	-	-	-
60-64	1.96	-	-	-	-	-
65-69	-	-	-	-	-	-
	<u>Females</u>					
15-19	-	-	-	-	0.47	0.36
20-24	-	-	-	0.64	0.49	0.44
25-29	-	-	0.88	0.68	0.61	0.55
30-34	-	1.19	0.92	0.82	0.74	0.51
35-39	1.55	1.20	1.07	0.97	0.67	0.94
40-44	1.47	1.30	1.19	0.83	1.05	-
45-49	1.47	1.35	0.96	1.08	-	-
50-54	1.37	1.02	1.00	-	-	-
55-59	0.96	0.82	-	-	-	-
60-64	0.58	-	-	-	-	-
65-69	-	-	-	-	-	-

Table 8 (contd)

Estimates of handmade cigarette consumption per person
per day in table 4.2 arranged by cohorts of each sex

<u>Age</u>	<u>Cohort years of birth</u>			
	<u>1948-53</u>	<u>1954-58</u>	<u>1959-63</u>	<u>1964-68</u>
			<u>Males</u>	
15-19	0.59	0.54	0.38	0.45
20-24	0.67	0.47	0.56	-
25-29	0.60	0.70	-	-
30-34	0.87	-	-	-
35-39	-	-	-	-
40-44	-	-	-	-
45-49	-	-	-	-
50-54	-	-	-	-
55-59	-	-	-	-
60-64	-	-	-	-
65-69	-	-	-	-
			<u>Females</u>	
15-19	0.33	0.30	0.20	0.37
20-24	0.40	0.27	0.48	-
25-29	0.38	0.62	-	-
30-34	0.79	-	-	-
35-39	-	-	-	-
40-44	-	-	-	-
45-49	-	-	-	-
50-54	-	-	-	-
55-59	-	-	-	-
60-64	-	-	-	-
65-69	-	-	-	-

Table 9

Percentage of national cigarette consumption approximately covered by the results of Labour Force Surveys

<u>Mid-quinquennial year</u>	<u>Manufactured cigarettes</u> %	<u>Handmade cigarettes</u> %	<u>Both types combined</u> %
1958			74.8
1963			67.3
1968			68.1
1973			65.9
1978	62.4	50.8	
1983	60.6	46.4	

Notes:

1. The percentages in the table represent the ratio of (1) national cigarette consumption implied by the product of the results available from Labour Force Surveys as applied by the writer, and the population in the mid-year of the quinquennium, to (2) national total consumption in the mid-year according to official statistics or estimates in this paper.
2. The estimates for 1958 were initially based on the results of the Labour Force Survey of 1964.
3. The numbers of handmade cigarettes smoked that formed the starting point of the estimates were those attributed to persons defined as being "usually" smokers of handmade cigarettes.

Table 10

Comparison of estimates of manufactured cigarette consumption per person per day derived using the adjusted cohort age-ratios assumption with estimates in table 4.1

Sex and age	Section A - 1971-75 quinquennium			Section B - 1956-60 quinquennium		
	Derived by ACAR assumption from 1976-85 data	Per table 4.1	% difference	Derived by ACAR assumption from 1966-75 data	Per table 4.1	% difference
<u>Males</u>						
15-19	6.99	7.28	-4.0	6.10	5.96	+2.3
20-24	13.00	13.66	-4.8	13.51	12.68	+6.5
25-29	14.02	14.21	-1.3	14.11	13.17	+7.1
30-34	14.78	14.81	-0.2	14.24	13.72	+3.8
35-39	15.24	15.22	+0.1	13.81	14.03	-1.5
40-44	15.26	15.24	+0.1	12.80	13.78	-7.1
45-49	14.71	14.66	+0.3	11.25	12.72	-11.6
50-54	13.53	13.38	+1.1	9.34	10.79	-13.4
55-59	11.77	11.42	+3.1	7.30	8.23	-11.3
60-64	9.38	8.99	+4.3	5.22	5.52	-5.4
65-69	6.30	6.45	-2.3	3.51	3.19	+10.0
70+	3.83	2.24	+71.0	1.17	0.56	+108.9
<u>Females</u>						
15-19	5.38	5.63	-4.4	2.97	2.65	+12.1
20-24	9.89	9.62	+2.8	7.73	7.49	+3.2
25-29	9.56	9.24	+3.5	7.45	7.16	+4.1
30-34	9.21	9.15	+0.7	7.20	6.98	+3.2
35-39	8.83	9.13	-3.3	6.78	6.73	+0.7
40-44	8.35	8.95	-6.7	6.04	6.25	-3.4
45-49	7.78	8.41	-7.5	4.93	5.45	-9.5
50-54	7.09	7.41	-4.3	3.56	4.32	-17.6
55-59	6.28	5.98	+5.0	2.23	3.05	-26.9
60-64	5.41	4.30	+25.8	0.95	1.85	-48.6
65-69	2.29	2.70	-15.2	0.38	0.94	-59.6
70+	0.80	0.59	+35.6	0.06	0.11	-45.5

Appendices

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Appendix 1

Estimation of means of class-intervals used in tables classifying
cigarette smokers by the number of cigarettes smoked per day

Cigarette smokers are frequently classified into smokers of various numbers of cigarettes per day, such as 1-19, 20-24, 25+, and different analysts have almost always adopted different groupings. The means of whatever groupings or class intervals have been adopted are often required so that the average consumption of all members of a sex and age group may be calculated, but are rarely provided. It has therefore become necessary to find some way of estimating, even if only approximately, the means of whatever class intervals have been used. In order to estimate the means of different sets of class intervals on a comparable and consistent basis, the writer (in Todd, 1978) introduced a standardised, detailed frequency distribution of the daily levels of cigarette consumption by male and female smokers that had applied in the UK and did not greatly differ from those in some other "western" countries to judge by such data as was available. This standardised distribution was revised in 1986 in the light of later information especially from New Zealand and is reproduced in table A1.1 at the end of this Appendix. It was then assumed that the mean of any class interval that was required - e.g. of men who smoked 16-24 cigarettes a day - would have been the same as the mean of those who had smoked the same number of cigarettes a day in the standard frequency distribution. (The means of smokers of 16-24 cigarettes a day in the standard distribution are 20.1 cigarettes for both men and women.)

This procedure does not involve the assumption that the average level of consumption of any age group of the country analysed is the same as that of the standard distribution, since each class interval of each age group has its own relative weight represented by the percentage of smokers in each class interval.

This procedure seems not unreasonable when the class intervals are small - e.g. 5 cigarettes as in ... 10-14, 15-19, 20-24 ... cigarettes a day. How valid it is when class intervals are large - e.g. 1-14, 15+ cigarettes - can only be ascertained when more detailed frequency distributions of cigarette consumption become available. Estimating the means of the open-ended highest class interval - e.g. 26+ cigarettes - was difficult because so little information about smokers of 30+ cigarettes a day was available. On the other hand, the very heavy smokers are the fewest numerically.

The use of the standard distribution in the way described may have slightly increased or decreased the average number of cigarettes smoked by a sex or age group above or below whatever may have been its true but unknown figure. This, however, is likely to have been relatively unimportant. Any such error would have been small and much less than the percentage by which the reported figures would have understated the true level of cigarette consumption.

Table A 1.1

Standard frequency distribution of cigarette consumption

<u>Cigarettes per day</u>	<u>1986 standard distribution</u>	
	<u>Male smokers</u> %	<u>Female smokers</u> %
1- 4	7	10
5	4	5
6- 9	6	10
10	13	17
11-14	7	8
15	8	11
16-19	4	4
20	25	20
21-24	6	5
25	4	3
26-29	2	1
30	5	2
31-34	1	1
35	1	0
36-39	0	0
40	4	2
41-44	0	0
45	0	0
46-49	0	0
50	2	1
51-59	0	0
60	1	0
61+	0	0
	<u>100</u>	<u>100</u>

Note: The zero percentages strictly mean "less than 0.5%."

*

Appendix 2

Daily cigarette consumption levels in official surveys of smoking
behaviour in Canada with adjustments for under-reporting
as estimated by the writer

In preparing estimates of cigarette consumption by sex and age per quinquennium from the official surveys of cigarette smoking behaviour in Canada, it was preferable to start with the estimates for the latest quinquennium (1981-85), for which the available information was fullest, and to work back to the earliest quinquennium (1950-60) for which there was least information. The estimates for 1976-80 and 1981-85 were based on data in the computer print-outs supplied by Health and Welfare Canada; estimates for earlier quinquennia were based on such figures as had been published.

1981-85 quinquennium

The results of sample surveys carried out in 1981 and 1983 were available for this quinquennium. Those for 1983, being the mid-year of the quinquennium, were taken as likely to provide a fair average of consumption figures for the quinquennium. Estimates of the percentages of regular cigarette smokers and of the daily level of cigarette consumption per cigarette smoker and per person were available by sex, 8 age groups and type of cigarette usually smoked. The figures are given in table A 2.1.

1976-80 quinquennium

Sample survey results were not available for 1978, the mid-year of the 1976-80 quinquennium, and consequently the means of the results from the 1977 and 1979 surveys were used to provide estimates for 1978. The analyses that could be made were the same as those for 1983. Estimates of daily consumption per person by sex and age are given in table A 2.2.

1971-75 quinquennium

Since the survey results in their less detailed and slightly different published form were used, this meant that estimates of cigarette consumption were available only for manufactured and handmade cigarettes combined and that analyses by age were limited to 5 age groups. The figures for 1973 were used as representing the average of the quinquennium. They are given in table A 2.3.

1966-70 quinquennium

The sample survey results for 1968 were used as the estimates for this quinquennium. The categories of information available were the same as those for 1973. The figures are given in table A 2.4.

1961-65 quinquennium

Ideally, one would like to have had the results of a sample survey in 1963 to represent the average of the quinquennium. Unfortunately, the earliest sample survey was the one carried out in 1964. The figures of that year were therefore used as the average of 1961-65.

Fortunately, the figures available for 1964 and the immediately following years (published by Thompson (1984) table 2.8.2, pp.79-82) suggested that these were years of relative stability in cigarette smoking habits, at least as they were reported to have been. It may be not unreasonable to assume that this period of stability had started earlier. The 1964 figures used as the average for 1961-65 are given in table A 2.5.

1956-60 quinquennium

No survey results were available for this quinquennium. It was therefore assumed that there would have been little change between the 1956-60 and 1961-65 quinquennia and that the 1964 results, which had been used as the average for 1961-65, could also be used for 1956-60. Since the values in each sex and age group would later be adjusted in the same proportions so that they became consistent with the total cigarette consumption per annum of the 1956-60 quinquennium, the only assumption made was that the relative ratios of cigarette consumption per person of the two sexes in 1956-60 were the same as those in 1964.

Extent of under-reporting of cigarette consumption and its correction

Whenever the estimates of cigarette consumption per person obtained in the sample surveys of smoking habits have been applied to the national population and compared with the national sales of manufactured cigarettes, known from tax returns or other sources, it has invariably been found that the consumption of manufactured cigarettes in the surveys has been under-reported. The extent of under-reporting has often been substantial. Sample surveys which had

received reports from informants that represented only about 66.6% of known cigarette sales have been found in a number of countries. But a survey coverage of only 66.6% means that cigarette smokers ought on the average to have informed the survey interviewers that they had smoked 50% more cigarettes than their replies had implied. What has happened in estimates of manufactured cigarettes smoked can be expected to have happened at least as much in estimates of handmade cigarettes since less is known about the latter by their smokers. It is therefore important that the errors which may have occurred in the results of the sample surveys of cigarette smoking levels used in the estimates of this paper should be ascertained as accurately as possible and adjustments made to offset them.

Unfortunately, the only error in sample survey results which can be measured is that in the overall average daily (or annual) cigarette consumption per person, both sexes and all age groups combined. In order to correct the sample results, it has therefore had to be assumed that the same percentage under-reporting of their true level of cigarette consumption had been made on the average by both sexes and all age groups. Obviously, exactly the same percentage under-reporting is unlikely to have occurred in each sex and age group, but where there has been a serious under-statement of the true overall level of smoking, it seems likely that some errors of under-reporting would have occurred in all sex and age groups. The immediate requirement, however, was to estimate the overall coverage of the sample surveys used for the quinquennial estimates and to calculate the adjustments consequently required to bring the national consumption levels implied by the figures of the sex and age groups into agreement with national totals.

From 1977, cigarette smokers were classified into two groups in the Labour Force Surveys, namely those who "usually" smoked manufactured cigarettes and those who similarly smoked handmade cigarettes. "Usually" was explained to informants when necessary as meaning "most often". Obviously some of those classified on this basis as smokers of manufactured cigarettes would have smoked some handmade cigarettes and, partially offsetting these, some classified as handmade cigarette smokers would have smoked some manufactured cigarettes. Possibly those classified as smokers of handmade cigarettes would have consisted largely of those who smoked handmade cigarettes only and those who smoked both types of cigarettes might have been classified largely among those who "usually" or "most often" smoked manufactured cigarettes. This suggestion arises from the fact that cigarette smokers appear to have been classified as smokers of handmade cigarettes only if they had not specified a brand of cigarettes which they "usually" or "most often" smoked. If such a tendency had occurred in the interview procedure, it could account, at least in part, for the greater under-reporting of handmade than manufactured cigarettes that has been found.

In adjusting estimated cigarette consumption for 1981-85 and 1976-80, manufactured and handmade cigarette consumption levels per person who "usually" smoked each type of cigarette have been increased to levels consistent with known or estimated national consumption levels of manufactured and handmade cigarettes respectively. Any errors, apart from sampling errors, in the adjusted sex and age group figures, would consist of compensating errors which would offset one another. This, however, does not mean that compensating errors were all necessarily small.

The sample coverage and adjustment factors are given in tables A 2.6 to 2.8 The adjusted estimates of cigarette consumption per person per day by sex and age are given in tables 2.1 and 2.2 following the text of the paper.

Table A 2.1

Percentages of current regular "usually manufactured" and "usually handmade" cigarette smokers and daily levels of cigarette consumption per cigarette smoker and per person by sex and 8 age groups in 1983

Sex and age	<u>"Usually manufactured cigarettes"</u>			<u>"Usually handmade cigarettes"</u>		
	%	<u>Daily consumption per-</u> <u>ctte smoker person</u>		%	<u>Daily consumption per-</u> <u>ctte smoker person</u>	
		cigarettes			cigarettes	
<u>Males</u>						
15-19	19.1	14.8	2.83	1.3	16.6	0.22
20-24	36.5	17.0	6.21	0.8	21.6	0.17
25-34	36.9	19.9	7.34	1.8	20.6	0.37
35-44	37.0	22.1	8.18	2.3	19.7	0.45
45-54	34.5	22.2	7.66	3.6	21.6	0.78
55-64	28.2	19.9	5.61	4.5	20.4	0.92
65-69	21.6	18.7	4.04	3.7	16.3	0.60
70+	16.5	16.9	2.79	3.6	18.0	0.65
All 15+	31.6	19.8	6.26	2.5	19.9	0.50
<u>Females</u>						
15-19	19.1	13.4	2.56	1.2	12.3	0.15
20-24	36.2	16.0	5.79	1.1	19.2	0.21
25-34	33.4	17.6	5.88	1.4	20.9	0.29
35-44	30.9	18.4	5.69	1.9	20.8	0.40
45-54	28.4	18.7	5.31	2.3	18.9	0.43
55-64	22.7	16.9	3.84	2.1	15.7	0.33
65-69	15.4	15.4	2.37	1.1	11.5	0.13
70+	9.5	15.5	1.47	0.3	9.2	0.03
All 15+	26.9	17.1	4.60	1.5	18.2	0.27

Table A 2.2

Daily consumption per person of "usually manufactured" and
"usually handmade" cigarettes by sex and 8 age groups in 1978

<u>Sex and age</u>	<u>"Usually manufactured cigarettes"</u>	<u>"Usually handmade cigarettes"</u>
<u>Males</u>		
15-19	3.92	0.18
20-24	7.47	0.26
25-34	8.80	0.36
35-44	9.12	0.52
45-54	8.25	1.08
55-64	6.69	1.22
65-69	4.41	1.36
70+	2.68	0.87
All 15+	7.14	0.62
<u>Females</u>		
15-19	3.47	0.10
20-24	6.44	0.14
25-34	6.38	0.21
35-44	5.93	0.43
45-54	5.40	0.43
55-64	3.88	0.49
65-69	2.63	0.29
70+	0.92	0.08
All 15+	4.90	0.28

Table A 2.3

Percentages of current regular smokers of manufactured and/or handmade cigarettes and daily cigarette consumption per cigarette smoker and per person by sex and 5 age groups in 1973

<u>Sex and age</u>	<u>% cigarette smokers</u>	<u>Daily cigarette consumption per cigarette smoker person</u> cigarettes	
<u>Males</u>			
15-19	34.4	14.59	5.02
20-24	52.8	17.58	9.28
25-44	53.4	19.63	10.48
45-64	50.8	19.86	10.09
65+	32.1	16.49	5.29
All 15+	47.8	18.66	8.92
<u>Females</u>			
15-19	28.6	13.37	3.82
20-24	40.9	15.80	6.46
25-44	38.3	16.81	6.44
45-64	32.0	16.19	5.18
65+	11.1	14.19	1.58
All 15+	32.4	15.82	5.13

Table A 2.6

Comparison of national cigarette consumption implied
by sample survey results with national totals and
calculation of adjustment factors in 1983 and 1978

	1983			1978		
	<u>Males</u>	<u>Females</u>	<u>Total</u>	<u>Males</u>	<u>Females</u>	<u>Total</u>
Daily cigarette consumption per person 15+						
Usually mfd. cttes.	6.26	4.60		7.14	4.90	
Usually hmd. cttes.	0.50	0.27		0.62	0.28	
Annual cigarette consumption per person 15+						
Usually mfd. cttes	2285	1679		2606	1789	
Usually hmd. cttes	183	99		226	102	
Population aged 15+ (000)	9526	9910		8763	9036	
Implied national consumption (millions)						
Usually mfd. cttes	21,767	16,639	38,406	22,836	16,165	39,001
Usually hmd. cttes	1,743	981	2,724	1,980	922	2,902
National totals per table 1.3 -						
Mfd. cttes			63,340			62,500
Hmd. cttes			5,874			5,712
Combined total			69,214			68,212
Coverage of surveys -						
Mfd. cttes			60.6%			62.4%
Hmd. cttes			46.4%			50.8%
Adjustment factors -						
Mfd. cttes			1.65			1.60
Hmd. cttes			2.16			1.97

Table A 2.7

Comparison of national cigarette consumption implied
by sample survey results with national totals and
calculation of adjustment factors in 1973 and 1968

	1973			1968		
	<u>Males</u>	<u>Females</u>	<u>Total</u>	<u>Males</u>	<u>Females</u>	<u>Total</u>
Daily cigarette consumption (mfd + hmd) per person 15+	8.92	5.13		9.37	4.91	
Annual cigarette consumption (mfd + hmd) per person 15+	3256	1872		3420	1792	
Population aged 15+ (000)	7878	8031		7034	7111	
Implied national consumption (millions)	25,651	15,034	40,685	24,056	12,743	36,799
National totals per table 1.3			61,767			54,047
Coverage of surveys			65.9%			68.1%
Adjustment factors			1.52			1.47

Table A 2.8

Comparison of national cigarette consumption implied
by sample survey results with national totals and
calculation of adjustment factors in 1963 and 1958

	1963			1958		
	<u>Males</u>	<u>Females</u>	<u>Total</u>	<u>Males</u>	<u>Females</u>	<u>Total</u>
Daily cigarette consumption (mfd + hmd) per person 15+	9.67	4.48		9.67	4.48	
				(as assumed in text)		
Annual cigarette consumption (mfd + hmd) per person 15+	3530	1635		3530	1635	
Population aged 15+ (000)	6263	6252		5752	5645	
Implied national consumption (millions)	22,108	10,222	32,330	20,305	9,230	29,535
National totals per table 1.3			48,015			39,500
Coverage of surveys			67.3%			74.8%
Adjustment factors			1.49			1.34

Appendix 3

How should estimates of manufactured and handmade cigarettes
consumption in Canada be combined?

The numbers of manufactured and handmade cigarettes estimated to have been smoked in past years by each sex and age group have had to be estimated separately because the total numbers of each type that were smoked were relatively large and because the type and quality of information relating to each were substantially different. For some purposes, however, and especially as a large number of smokers have smoked both types of cigarettes, it is valuable to have combined totals of the consumption of both types. But on what basis should the estimates of manufactured and handmade cigarettes be combined?

The simplest procedure would be to add together the numbers of the two types of cigarettes that were smoked. There are, however, some detailed differences between manufactured and handmade cigarettes. For example, they may contain different mixtures of the various types, growths, grades and crops of tobacco, different quantities of tobacco and different types and quantities of additives. The two types of cigarettes are likely to be smoked with the tobacco containing different percentages of moisture. The paper wrappers of the two types of cigarettes may have different porosity and the filters (if any) may have different effects on the smoke. If these and other differences can be disregarded it would seem reasonable to add together the numbers of the two types of cigarettes.

In some countries, manufactured and handmade cigarettes have contained different quantities of tobacco. In Canada it is possible, though not certain, that in recent past years manufactured and handmade cigarettes may have contained on the average, about the same amount of tobacco. Weighings of the tobacco content of 92 different variants (by brand name, type, length, etc.) of manufactured cigarettes on sale to the public in Canada in the Fall of 1985 suggested that, when smoked, the average cigarette would have contained about 0.8 g of tobacco. This figure was an arithmetical average of the 92 variants; it was not a sales-weighted average. On the other hand, the brands and types of cigarettes with the largest sales might be expected to have had the largest number of variants on the market so that there would have been some degree of weighting, related to sales, of the average tobacco content of different types of cigarettes. As stated in section 1.1 of the paper, it is possible that in 1986 the average handmade cigarette smoked in Canada may have contained about 0.83 g of tobacco. However, even if the average manufactured and handmade cigarettes smoked in Canada should have contained about the same amount of tobacco in recent past years, this would not necessarily have been true in earlier years.

On the other hand, if the tobacco content of cigarettes should be important, then presumably what is important is not the weight of tobacco in the unsmoked cigarette but the weight smoked. In the small survey of handmade cigarette smokers in 1986 just mentioned, those who used 70 mm paper wrappers without filters smoked an average of about 0.46 g of tobacco per cigarette; those who used tubes with a 12.5 mm filter smoked an average of 0.69 g of tobacco per cigarette. ("Tobacco smoked" was defined here as the weight of tobacco in the unsmoked

cigarette less the weight in the discarded butt. The weight "smoked" thus included the weight consumed during smouldering.) Estimates for manufactured cigarettes are not available.

Of course the discussion can be carried further. Interest has centered, not on the quantity of tobacco burnt, only part of which would enter into main stream smoke, but on the quantity of certain products such as tar in the main stream smoked produced during the smoking of the cigarette. Estimates of the average tar delivery of manufactured cigarettes sold in Canada, determined in accordance with certain conventions and weighted according to the sales of the brands, are available for the years 1968-81 and are given in table, A 3.1. No estimates of the tar delivery of handmade cigarettes have been published but Health and Welfare Canada have judged (Millar, 1983, p.8) that handmade cigarettes fell into the category of "high tar" cigarettes which meant that they were deemed to deliver 16 or more mg of tar per cigarette.

Table A 3.1

Sales-weighted average dry and wet tar delivery per manufactured
cigarette

<u>Year</u>	<u>mg per cigarette</u>	
	<u>Dry tar</u>	<u>Wet tar</u>
1968	21.1	26.5
69	19.6	25.3
1970	18.7	24.2
71	18.7	23.9
72	18.6	23.5
73	17.0	22.2
74	16.9	22.2
1975	17.0	21.3
76	16.6	
77	15.8	
78	15.0	
79	14.2	
1980	13.7	
81	13.2	

Sources: Dry tar figures were based on measurements by the writer of chart 4 of Millar (1983, p.70) supplemented by information from Dr. W.S. Rickert (private communication), from Rickert and Robinson (1981) and Canadian Tobacco Manufacturer's Council. Wet tar figures are from Thompson (1984, table 1.1.2). Tar delivery of Canadian cigarettes was estimated from 1968-75 on a wet tar basis. Later, these estimates were converted to a dry tar basis.

Appendix 4

Population of Canada by sex and age in mid-quinquennial years

For convenience of reference, the estimated populations aged 15+ of each sex by 5-year age groups of the mid-years of the 13 quinquennia used in calculating the estimates of cigarette consumption in this paper are reproduced in this Appendix.

Table A 4.1

Population (in '000) aged 15+: Males

<u>Age group</u>	<u>1923</u>	<u>1928</u>	<u>1933</u>	<u>1938</u>	<u>1943</u>	<u>1948</u>	<u>1953</u>
15-19	419	478	525	560	554	535	552
20-24	362	415	487	509	545	546	553
25-29	346	372	428	465	492	523	582
30-34	339	351	378	410	450	488	546
35-39	340	351	358	372	407	447	528
40-44	298	330	350	347	362	400	478
45-49	252	297	330	334	332	353	414
50-54	206	242	286	312	318	322	358
55-59	158	182	218	260	285	293	304
60-64	133	147	164	192	231	253	265
65-69	96	112	127	146	172	201	232
70-74	64	78	92	103	118	140	173
75+	66	77	92	110	124	149	177
All 15+	3079	3432	3835	4120	4390	4650	5162
	<u>1958</u>	<u>1963</u>	<u>1968</u>	<u>1973</u>	<u>1978</u>	<u>1983</u>	
15-19	644	810	995	1138	1218	1100	
20-24	587	629	830	977	1129	1202	
25-29	624	597	679	889	1011	1137	
30-34	631	635	634	722	916	1035	
35-39	592	640	649	638	725	922	
40-44	538	581	642	649	634	728	
45-49	482	527	570	620	638	630	
50-54	405	465	508	559	598	631	
55-59	336	382	440	474	532	580	
60-64	273	305	350	404	436	500	
65-69	236	245	267	311	360	395	
70-74	192	195	200	220	255	302	
75+	212	252	270	277	311	364	
All 15+	5752	6263	7034	7878	8763	9526	

Sources: 1923-1973 figures from Vital Statistics, vol.III, Deaths, 1973 published by Statistics Canada. Figures for 1978 and 1983 from later publications by Statistics Canada.

Table A 4.1

Population (in '000) aged 15+: Females

<u>Age group</u>	<u>1923</u>	<u>1928</u>	<u>1933</u>	<u>1938</u>	<u>1943</u>	<u>1948</u>	<u>1953</u>
15-19	417	457	514	551	544	527	540
20-24	372	415	475	503	539	549	554
25-29	346	368	399	453	487	530	591
30-34	318	335	346	379	436	488	564
35-39	298	318	332	341	377	437	523
40-44	255	286	309	325	337	376	457
45-49	214	252	274	293	308	333	382
50-54	176	206	236	262	284	299	335
55-59	142	162	183	218	244	265	292
60-64	118	133	142	165	199	225	249
65-69	87	102	115	132	154	179	213
70-74	60	74	87	98	112	131	166
75+	69	80	95	116	132	158	190
All 15+	2872	3206	3507	3826	4153	4497	5056
	<u>1958</u>	<u>1963</u>	<u>1968</u>	<u>1973</u>	<u>1978</u>	<u>1983</u>	
15-19	627	788	968	1093	1166	1049	
20-24	582	635	827	973	1120	1187	
25-29	603	591	675	885	1011	1146	
30-34	631	614	617	702	901	1038	
35-39	598	642	626	615	709	911	
40-44	527	589	641	623	621	718	
45-49	455	519	580	623	624	621	
50-54	376	447	510	579	619	626	
55-59	320	366	436	492	576	615	
60-64	270	305	357	421	479	563	
65-69	232	258	292	345	410	464	
70-74	193	211	236	264	315	379	
75+	231	287	346	416	485	593	
All 15+	5645	6252	7111	8031	9036	9910	

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