THE CANADA PENSION PLAN

Actuarial Report

GOVERNMENT OF CANADA

Department of National Health and Welfare

November 6, 1964

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ROGER DUHAMEL, F.R.S.C.
Queen's Printer and Controller of Stationery
Ottawa, Canada
1965

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CANADA PENSION PLAN

Actuarial Report

I. GENERAL

The financial estimates described in the Actuarial Report on the Canada Pension Plan dated August 30, 1963, were based on the proposals as respects coverage, benefits and contributions that were described by the Minister of National Health and Welfare to the House of Commons on July 18, 1963. Since that time, many changes in those initial proposals have been made. In order that ready reference to the structure and manner of operation of the Plan, as now proposed, and to the financial estimates based thereon will be available in one place, all of the relevant portions of the Actuarial Report dated August 30, 1963, and of subsequent actuarial studies have been incorporated in this report. The estimates presented in this report are in respect of all of Canada except the province of Quebec, where a plan identical to the Canada Pension Plan, or nearly so, will be administered by that province.

Two main sets of financial estimates, namely, "short-range" estimates and "long-range" estimates were made.

The short-range estimates cover a ten-year period from the effective date of the Plan. Even for this relatively short period, some assumptions required for the estimates relate to areas that are not readily predictable until experience develops under the Plan. For all major areas where probable future experience was obscure, an attempt was made to use assumptions that would not underestimate the cost.

The long-range estimates were developed mainly as percentages of contributory earnings required to provide benefits and expenses of administration for quinquennial years commencing in 1980 and ending in 2050. For the long term, since many elements entering the calculations cannot be predicted with any degree of confidence, two sets of estimates, namely, "high cost" estimates and "low cost" estimates, were produced.

The body of this report includes three further sections. In the first following section is given a résumé of the general aspects of coverage, benefits and contributions under the Plan. In the second following section, the principal assumptions underlying the short-range estimates are outlined and several tables are included in which are presented statistics relating to contributions, benefits, percentage costs and financing developments in accordance with the stated assumptions. In the final section, the principal assumptions underlying the long-range estimates are outlined and costs are presented as percentages of contributory earnings.

In six appendices are described the details of the principal assumptions, their rationale and the statistical developments based on them. Speci-

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fically, in Appendix 1 is described the development of population projections, in Appendix 2 the development of rates of participation in covered employment, in Appendix 3 the development of average earnings, in Appendix 4 the development of contributions and age retirement benefits, in Appendix 5 the development of death and survivors' benefits, and in Appendix 6 the development of disability benefits.

II. MAIN ASPECTS OF THE CANADA PENSION PLAN

1. *Coverage*

In general, the Canada Pension Plan will pertain to virtually all paid workers (both wage-earners and self-employed persons), between the ages of 18 and 70, in Canada except workers in the province of Quebec. The two main exceptions are workers with annual earnings less than certain specified minimum amounts and members of the armed services.

2. *Definition of Terms Relating to Earnings*

Four terms relating to the earnings of contributors that are used frequently in the remainder of this report are defined and described below. It should be emphasized that these terms are applicable only for purposes of this report. They were chosen to be as self-explanatory as possible.

Contributory Earnings Upper Limit

"Contributory earnings upper limit" for any year means the maximum earnings on which contributions can be made in that year.

For 1966 and 1967, the contributory earnings upper limit will be $5,000. For the period 1968 to 1975, such limit will be adjusted upward in steps of integral hundreds of dollars in accordance with increases, if any, in a "Pension Index" based on the Consumer Price Index for Canada. After 1975, such limit will be adjusted upward or downward in steps of integral hundreds of dollars in accordance with changes in an "Earnings Index" based on annual average earnings determined from earnings data recorded for persons with employee status by the Department of National Revenue.

Contributory Earnings Lower Limit

"Contributory earnings lower limit" for any year means the amount of annual earnings below which earnings are not subject to contributions under the Plan in that year.

A worker with salary and wages in any year greater than the contributory earnings lower limit is required to contribute under the Plan on all earnings between that limit and the contributory earnings upper limit.

A worker with salary and wages lower than the contributory earnings lower limit is required to contribute under the Plan provided that the total of his self-employed earnings and salary and wages are about one-third (or more) greater than the contributory earnings lower limit. For example, for 1966, when the contributory earnings lower limit will be $600 and the contributory earnings upper limit will be $5,000, a worker with salary and wages below $600 will be required to contribute on earnings between $600 and $5,000 provided that his total earnings are $800

or more; if such a worker has total earnings of less than $800 he will not be eligible to contribute under the Plan.

The contributory earnings lower limit is subject to automatic adjustment in future years in the same way as that described above for the contributory earnings upper limit.

Contributory Earnings

"Contributory earnings" for any year means the earnings of a contributor falling between the contributory earnings lower limit and the contributory earnings upper limit for that year. (These are the earnings on which contributions are based.)

Pensionable Earnings

"Pensionable earnings" for any year means all earnings of a contributor up to the contributory earnings upper limit provided that required contributions have been made in that year. (These are the earnings on which earnings-related benefits are based.)

3. *Automatic Adjustment Features*

Several elements of the Plan are subject to automatic adjustment in accordance with changes in a specified index. These elements include

(a) the contributory earnings upper limit and, dependent thereon, the upper limit on the amount of death benefit,

(b) the contributory earnings lower limit and, dependent thereon, the minimum amount of total earnings necessary for a worker with salary and wages below the contributory earnings lower limit to contribute under the Plan,

(c) the flat-amount component of a disability pension,

(d) the flat-amount component of a widow's (or a disabled widower's) pension,

(e) the flat-amount orphan's pension, and

(f) all pensions in payment.

Annual adjustment of all elements subject to automatic adjustment except, after 1975, the contributory earnings limits will depend on changes in a Pension Index constructed as described in the next following paragraph. Annual adjustment of the contributory earnings limits after 1975 will depend on changes in an Earnings Index constructed as described in the second following paragraph.

For 1967, the Pension Index will be computed as the average of the Consumer Price Indexes for Canada for the twelve months ending with June, 1966. For 1968 and each following year, the Pension Index will be computed as the average of the Consumer Price Indexes for the twelve months ending with June of the preceding year or 1.02 times the Pension Index for the preceding year, whichever is the lesser, except that the Pension Index for the preceding year is retained for the current year if the calculated change is less than an increase of 1 per cent. (It will be noted from the foregoing description that, for the Pension Index and, consequently, for all elements that depend for adjustment on that index, there

can never be any downward adjustment nor can there be any annual upward adjustment of less than 1 per cent or more than 2 per cent.)

The Earnings Index will be computed as the average of average annual earnings, determined by the Department of National Revenue, for the eight consecutive years ending with the year two years prior to the year for which the contributory earnings limits will apply divided by the corresponding average for the first eight years of operation of the Plan.

4. *Earnings Test*

Any age retirement pension that commences at an age less than 70 will be subject to the operation of an earnings test until age 70 is reached. The earnings test is such that the annual age retirement pension of a contributor will be reduced by $1 for each $2 of earnings in excess of approximately 18 per cent of the contributory earnings upper limit and will be reduced further by $1 for each $2 of earnings in excess of approximately 30 per cent of that limit.

5. *Age Retirement Pensions*

A contributor may become entitled to an age retirement pension at any age 65 to 70, subject to a minimum age requirement within this range in the very early years of operation of the Plan. (A contributor in receipt of a disability pension on attainment of age 65 becomes entitled immediately to an age retirement pension.) After such a pension becomes payable or, in any event, after age 70, a contributor is not eligible to contribute under the Plan. Thus, except for the operation of the "earnings test" and adjustment of the amount of pension in payment in accordance with changes in the Pension Index, the amount of pension is fixed at the time the pension first becomes payable.

In general, the initial amount of age retirement pension payable to a contributor will be based on the whole history of his pensionable earnings from the effective date of the Plan or from age 18, if that age is attained after the effective date, until the year in which his pension commences. However, in determining the amount of pension, a contributor's pensionable earnings for each year will be adjusted in the ratio that the average of the contributory earnings upper limits for the three years ending with the year in which pension commences bears to the contributory earnings upper limit for the year in which contributions were made. Subject to the operation of the earning test, "full" pensions will be available in 1976 and after.

Age retirement pensions in payment will be subject to automatic adjustment in accordance with changes in the Pension Index.

A convenient formula for determining the initial amount of age retirement pension is as follows:

Formula for Age Retirement Pension

Initial Amount of Annual Pension

25 per cent of the average of the contributory earnings upper limits for the three years ending with the year in which pension commences multiplied by the "average earnings ratio".

Average Earnings Ratio

(a) Within the first ten years from the effective date of the Plan, the total of recorded "annual earnings ratios" divided by ten minus the number of years, if any, during which a disability pension was payable.

(b) After at least ten years have elapsed from the effective date of the Plan, the average of a number of the highest recorded "annual earnings ratios", such number being,

(i) if the number of years in the "primary contribution period" is less than ten, the greater of ten minus the number of years, if any, during which a disability pension was payable or the number of years in the primary contribution period,

(ii) if the number of years in the "primary contribution period" is ten or more, the greater of ten or 90 per cent of the number of years in the "primary contribution period".

Annual Earnings Ratio

The ratio of pensionable earnings in a calendar year to the contributory earnings upper limit for that year. (It should be noted that if no contributions are made during a calendar year, the "annual earnings ratio" recorded for that year is zero.)

Primary Contribution Period

The number of years from the effective date of the Plan or from age 18, if that age is attained after the effective date, to age 65 less the number of years, if any, during which a disability pension was payable.

Examination of the above formula will make it clear that, in addition to the exclusion from the benefit calculations of the whole period during which a disability pension is payable, certain lowest recorded annual earnings ratios may, under usual circumstances after the Plan has been in operation for 10 years, be excluded from the benefit calculations by reason of contributions made after age 65 and by reason of a 10 per cent "drop-out" provision.

The following four examples are given to illustrate the operation of the benefit formula. For all examples, it is assumed that the effective date of the Plan is January 1, 1966, and that the contributory earnings upper limit is $5,000 for 1966 and 1967 and increases by $100 for each year thereafter.

(a) Suppose that a worker aged exactly 60 at the effective date has annual pensionable earnings of $5,000 for each of the first five years and that he elects to have his pension commence immediately thereafter, that is, at age 65.

Initial amount of annual pension

=Average earnings ratio × average of the contributory earnings limits for the three years ending with the year in which pension commences × 25 per cent,

$$= \frac{1}{10}\left(2 \times \frac{5,000}{5,000} + \frac{5,000}{5,100} + \frac{5,000}{5,200} + \frac{5,000}{5,300}\right) \times \frac{1}{3}\left(5,200 + 5,300 + 5,400\right) \times 0.25$$

$$= 0.4885 \times 5,300 \times 0.25$$

$$= \$647$$

(b) Suppose that a worker aged exactly 60 at the effective date has annual pensionable earnings of $5,000 for each of the first ten years and that he elects to have his pension commence at age 70.

Initial amount of annual pension

$$= \frac{1}{10}\left(2 \times \frac{5,000}{5,000} + \frac{5,000}{5,100} + \frac{5,000}{5,200} + \frac{5,000}{5,300} + \frac{5,000}{5,400} + \frac{5,000}{5,500} + \frac{5,000}{5,600} + \frac{5,000}{5,700} + \frac{5,000}{5,800}\right) \times \frac{1}{3}\left(5,700 + 5,800 + 5,900\right) \times 0.25$$

$$= 0.9353 \times 5,800 \times 0.25$$

$$= \$1,356$$

(c) Suppose that a worker aged exactly 45 at the effective date has earnings of $3,000 in 1966, that his earnings increase by $200 for each year after 1966 up to and including the year in which he attains age 69, and that he elects to have his pension commence at age 70. The pertinent details relating to the calculation of his pension are shown in the schedule below. (It will be noted that, for each year after 1984, the amount of the worker's pensionable earnings is the same as the contributory earnings upper limit for the year even though the amount of his actual earnings becomes increasingly greater than the applicable contributory earnings upper limit.)

Year	Contributory Earnings Upper Limit	Age of Worker	Pensionable Earnings	Annual Earnings Ratio
	$		$	
1966	5,000	45	3,000	0.6000
1967	5,000	46	3,200	0.6400
1968	5,100	47	3,400	0.6667
1969	5,200	48	3,600	0.6923
1970	5,300	49	3,800	0.7170
1971	5,400	50	4,000	0.7407
1972	5,500	51	4,200	0.7636
1973	5,600	52	4,400	0.7857
1974	5,700	53	4,600	0.8070
1975	5,800	54	4,800	0.8276
1976	5,900	55	5,000	0.8475
1977	6,000	56	5,200	0.8667
1978	6,100	57	5,400	0.8852
1979	6,200	58	5,600	0.9032
1980	6,300	59	5,800	0.9206
1981	6,400	60	6,000	0.9375
1982	6,500	61	6,200	0.9538
1983	6,600	62	6,400	0.9697
1984	6,700	63	6,600	0.9851
1985	6,800	64	6,800	1.0000
1986	6,900	65	6,900	1.0000
1987	7,000	66	7,000	1.0000
1988	7,100	67	7,100	1.0000
1989	7,200	68	7,200	1.0000
1990	7,300	69	7,300	1.0000
1991	7,400	70		

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For this worker, the number of "highest" annual earnings ratios to be taken into account in calculating the average earnings ratio is 18 (that is, 90 per cent of the number of years from age 45 to age 65).

Average earnings ratio

$$= \frac{16.6896}{18}$$
$$= 0.9272$$

Initial amount of annual pension

$$= 0.9272 \times \frac{1}{3}\left(7{,}200 + 7{,}300 + 7{,}400\right) \times 0.25$$
$$= \$1{,}692$$

(d) Suppose that an immigrant who arrives in Canada in 1975 and commences work on January 1, 1976, is of exactly the same age and has exactly the same earnings history for the period from 1976 to 1986, inclusive, as the worker described in (c) above, and that he elects to have his pension commence at age 66.
For this worker, the number of "highest" annual earnings ratios to be taken into account in calculating the average earnings ratio is also 18 but seven of these annual earnings ratios must be zero since there is a record of pensionable earnings for only 11 years.

Average earnings ratio

$$= \frac{10.2693}{18}$$
$$= 0.5705$$

Initial amount of annual pension

$$= 0.5705 \times \frac{1}{3}\left(6{,}800 + 6{,}900 + 7{,}000\right) \times 0.25$$
$$= \$984$$

6. *Disability Pensions*

A contributor aged less than 65, who becomes disabled within the meaning of the disability provisions of the Plan, will be entitled to a disability pension provided that contributions have been made in

(a) five calendar years, and

(b) the lesser of ten calendar years or one-third of the number of calendar years in which contributions could have been made, and

(c) five of the last ten or less calendar years in which contributions could have been made.

By the expression "calendar years in which contributions could have been made" is meant all calendar years from the effective date of the Plan or from age 18, if that age is attained after the effective date, to the date of commencement of the disability pension, except for any calendar years during the whole of which a disability pension was previously payable.

Disability pensions will commence in the fourth month after the month of disablement and will be payable until age 65 or until death or recovery

from disability at an earlier age. Unlike age retirement pensions, disability pensions will not be reduced by reason of their commencement within the first ten years of operation of the Plan.

Disability pensions in payment will be subject to automatic adjustment in accordance with changes in the Pension Index.

The amount of pension initially payable is composed of two parts, namely, a flat-amount part depending only on the year in which the disability pension commences, and an earnings-related part depending on the pensionable earnings record of the contributor to the date of commencement of the disability pension. The flat-amount part will be determined as $25 per month adjusted in accordance with changes in the Pension Index from 1967 to the year in which the disability pension commences. The earnings-related part will be equal to 75 per cent of an earnings-related pension calculated in the manner described for age retirement pensions in subsection 5 above except that the contributor's primary contribution period ends at the date of commencement of the disability pension and that, both during and after the ten-year transitional period from the effective date of the Plan, the number of years to be taken into account in determining the "average earnings ratio" is

(a) if the number of years in the primary contribution period is less than ten, the number of years in the primary contribution period, or

(b) if the number of years in the primary contribution period is ten or more, the greater of ten or 90 per cent of the number of years in the primary contribution period.

The following three examples are given to illustrate the determination of the initial amount of a disability pension. For all examples, it is assumed that the effective date of the Plan is January 1, 1966, that the contributory earnings upper limit is $5,000 for 1966 and 1967 and increases by $100 for each year thereafter, and that the flat-amount component of the disability pension is $25 per month in 1967 and increases by 50¢ for each year thereafter.

(a) Suppose that a worker aged exactly 55 at the effective date has annual pensionable earnings of $5,000 for each year 1966 to 1972, inclusive, and that a disability pension becomes payable to him in January, 1973.

Initial amount of annual pension

$$= 28.00 \times 12 + 0.75 \left[\frac{1}{7}\left(2 \times \frac{5,000}{5,000} + \frac{5,000}{5,100} + \frac{5,000}{5,200} + \frac{5,000}{5,300} + \frac{5,000}{5,400} + \frac{5,000}{5,500}\right) \times \frac{1}{3}\left(5,400 + 5,500 + 5,600\right) \times 0.25\right]$$

$$= 336 + 990$$

$$= \$1,326$$

(b) Suppose that a worker aged exactly 45 at the effective date has the same history of earnings from 1966 to 1980, inclusive, and, consequently, the same annual earnings ratios for those years, as the worker described in example (c) of subsection 5 above and that a disability pension becomes payable to him in January, 1981.

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For this worker, the number of "highest" annual earnings ratios to be taken into account in calculating the average earnings ratio for the earnings-related part of his pension is $13\frac{1}{2}$ (that is, 90 per cent of the number of years from age 45 to age 60).

Average earnings ratio

$$= \frac{10.7438}{13.5}$$
$$= 0.7958$$

Initial amount of annual pension

$$= 32.00 \times 12 + 0.75 \left[0.7958 \times \frac{1}{3} \left(6{,}200 + 6{,}300 + 6{,}400\right) \times 0.25\right]$$
$$= 384 + 940$$
$$= \$1{,}324$$

(c) Suppose that a worker aged exactly 18 on January 1, 1976, has annual pensionable earnings of $3,000 for each year 1976 to 1980, inclusive, and that a disability pension becomes payable to him in January, 1981.

Initial amount of annual pension

$$= 32.00 \times 12 + 0.75 \left[\frac{1}{5} \left(\frac{3{,}000}{5{,}900} + \frac{3{,}000}{6{,}000} + \frac{3{,}000}{6{,}100} + \frac{3{,}000}{6{,}200} + \frac{3{,}000}{6{,}300}\right) \times \frac{1}{3} \left(6{,}200 + 6{,}300 + 6{,}400\right) \times 0.25\right]$$
$$= 384 + 581$$
$$= \$965$$

7. *Survivors' Pensions*

(a) *General*

A widow, a "dependent" disabled widower or an orphan may become entitled to a survivor's pension. For entitlement to such a pension, the deceased contributor must have made contributions in

(i) at least three calendar years, and

(ii) the lesser of ten calendar years or one-third of the number of calendar years in which contributions could have been made.

By the expression "calendar years in which contributions could have been made" is meant all calendar years from the effective date of the Plan or from age 18, if that age is attained after the effective date, to the date of death if death occurs before age 65 or, otherwise, to the later of attainment of age 65 or cessation of contributions, except for any calendar years during the whole of which a disability pension was payable.

A widow aged less than 65 may become entitled to a widow's pension by reason of having dependent children, being disabled or simply being over age 35 at widowhood. However, a widow who becomes entitled to a widow's pension for more than one reason will receive only one widow's pension—the amount of pension being the largest to which she is entitled for any one of such reasons.

A widow (or a disabled widower) may become entitled to both a survivor's pension and either a disability pension or an age retirement

pension. However, the total annual amount of the two pensions cannot initially exceed an amount equal to 25 per cent of the average of the contributory earnings upper limits for the three years ending with the year in which the later of the two pensions commences (that is, except in the early years of operation of the Plan, an amount equal to the maximum age retirement pension applicable for that year).

A widow's (or a disabled widower's) pension will be suspended during any period of remarriage.

As for disability pensions, survivors' pensions will not be reduced by reason of their commencement within the first ten years of operation of the Plan.

Survivors' pensions in payment will be subject to automatic adjustment in accordance with changes in the Pension Index.

(b) *Widows' Pensions*

(i) *Definition of "widow with dependent children"*

A "widow with dependent children" means a widow who wholly or substantially maintains an unmarried child of the deceased contributor where the child

A. is under age 18,

B. is aged 18 or over but under age 25 and has been attending school substantially without interruption since attainment of age 18 or the time of the contributor's death, whichever occurred later, or

C. is aged 18 or over and is disabled, having been disabled without interruption since attainment of age 18 or the time of the contributor's death, whichever occurred later.

(ii) *Widows aged between 45 and 65 at widowhood*

A widow aged between 45 and 65 at the death of her "contributor" husband is entitled to a widow's pension, whether or not she has dependent children or is disabled.

The amount of pension initially payable is composed of two parts, namely, a flat-amount part depending only on the year of death of the contributor and an earnings-related part depending on the pensionable earnings record of the deceased contributor to the date of his death. The flat-amount part will be determined as $25 per month adjusted in accordance with changes in the Pension Index from 1967 to the year in which the death of the contributor occurs. The earnings-related part will be equal to 37½ per cent of an earnings-related pension based on the contributor's pensionable earnings record, calculated as at the date of the contributor's death or commencement of his age retirement pension, whichever is the earlier, except that, in the latter case, the calculated pension will be adjusted in accordance with changes in the Pension Index from the year in which the age retirement pension became payable to the contributor to the year of his death. In general, the amount of the contributor's earnings-related pension will be calculated in the manner described for age retirement pensions in subsection 5 above except that the primary contribution period ends at the date of death or at age 65, whichever is the earlier, and that, both during and after the ten-year transitional period from the effective date of the Plan, the number of years to be taken into account in determining the "average earnings ratio" is,

A. if the number of years in the primary contribution period is less than ten, the number of years in the primary contribution period, or

B. if the number of years in the primary contribution period is ten or more, the greater of ten or 90 per cent of the number of years in the primary contribution period.

(iii) *Widows aged less than 45 at widowhood, without dependent children and not disabled*

A widow aged 35 or less at the death of her "contributor" husband, without dependent children and not disabled, is not entitled to a widow's pension.

A widow aged more than 35 but less than 45 at the death of her "contributor" husband, without dependent children and not disabled, is entitled to an amount of pension, calculated as described in (ii) above, reduced by 1/120th of such amount for each month that her age, at the date of death of the contributor, is less than 45.

(iv) *Widows aged less than 45 at widowhood, with dependent children*

A widow aged less than 45 at the death of her "contributor" husband, with dependent children, is entitled to a widow's pension calculated as described in (ii) above.

If a widow in receipt of a widow's pension is aged less than 45 and not disabled at the time her last dependent child ceases to be a dependent child, the amount of her pension is discontinued or reduced in the manner described in (iii) above in accordance with her age at the time her last dependent child ceases to be a dependent child except that, for the purpose of determining such age, a non-disabled child attending school after age 18 is deemed not to be a dependent child.

(v) *Disabled widows*

A widow aged less than 65 is entitled to a disabled widow's pension if she either is disabled at the date of death of the contributor or becomes disabled at a later date.

The disabled widow's pension is payable from the month following the month in which the contributor died or from the month following the month in which the widow is disabled, whichever is the later. The initial amount of pension is calculated as described in (ii) above, except that, in the case where the widow becomes disabled subsequent to the death of the contributor, the pension so calculated is adjusted in accordance with changes in the Pension Index from the year in which the contributor died to the year in which disability occurred. The calculated initial amount of pension is subject to the limitation on the maximum initial amount payable in respect of dual pensions, as explained in (a) above.

(vi) *Widows aged 65 or over*

At age 65, or upon widowhood at a later age, a widow who is not then in receipt of an age retirement pension or to whom such a pension does not become immediately payable, is entitled to an amount of pension equal

to 60 per cent of an earnings-related pension* based on the pensionable earnings record of her "contributor" husband.

At the time that a widow becomes entitled to both a widow's pension and an age retirement pension or to either one if she is then in receipt of the other, the total amount of pension will be equal to the greater of

A. 60 per cent of the widow's own age retirement pension plus 60 per cent of an earnings-related pension* based on the pensionable earnings record of her "contributor" husband, or

B. 100 per cent of the widow's own age retirement pension plus 37½ per cent of an earnings-related pension* based on the pensionable earnings record of her "contributor" husband,

subject to the limitation on the maximum initial amount payable in respect of dual pensions, as explained in (a) above.

(c) *Disabled Widowers' Pensions*

A widower of any age who was wholly or substantially maintained by his "contributor" wife before her death is entitled to a disabled widower's pension if he is disabled at the time of death of the contributor.

The initial amount of pension payable to a disabled widower aged less than 65 will be determined in the manner described for widows' pensions in (b) (ii) above. The initial amount of pension payable to a disabled widower at age 65 or after will be determined in the manner described for widows' pensions in (b) (vi) above.

(d) *Orphans' Pensions*

For purposes of orphans' pensions, an "orphan" means an unmarried child of a deceased male contributor or of a deceased female contributor who wholly or substantially maintained the child immediately before her death where the child

(i) is under age 18, or

(ii) is aged 18 or over but under age 25 and has been attending school substantially without interruption since attainment of age 18 or the time of the contributor's death, whichever occurred later.

The initial amount of pension payable in respect of each orphan will be $25 per month adjusted in accordance with changes in the Pension Index from 1967 to the year of death of the contributor.

The total initial amount of orphans' pensions payable in respect of one family cannot exceed 25 per cent of the average of the contributory earnings upper limits for the three years ending with the year of death of the contributor.

8. *Death Benefits*

A lump-sum benefit will be paid to the estate of a deceased contributor who had made contributions in at least the minimum number of calendar years required for entitlement to a survivor's pension.

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*An earnings-related pension, calculated as described in (ii) above, adjusted, where applicable, in accordance with changes in the Pension Index from the year in which the contributor died to the year in which the widow attains age 65 or the year in which an age retirement pension becomes payable to her while she is in receipt of a widow's pension.

The amount of benefit will be equal to,

(a) in respect of a contributor to whom an age retirement pension was not payable at the time of death, one-half of the annual amount of an earnings-related pension calculated in the manner described for age retirement pensions in subsection 5 above except that the deceased contributor's primary contribution period ends at the date of death or at age 65, whichever is the earlier, and that there is no reduction by reason of death occurring within the first ten years from the effective date of the Plan, or

(b) in respect of a contributor to whom an age retirement pension was payable at the time of death, one-half of the annual amount of pension payable in the year of death, adjusted to exclude any reduction that may have arisen by reason of commencement of pension within the first ten years from the effective date of the Plan,

subject to the limitation that the amount of benefit cannot exceed ten per cent of the contributory earnings upper limit applicable in the year of the contributor's death.

9. *Contributions*

No worker who is under age 18 or over age 70, who has earnings less than the minimums required for contribution purposes or who is in any specifically excluded class of workers is eligible to contribute under the Plan. Also, no contributor to whom an age retirement pension or a disability pension is payable is eligible to contribute.

For workers eligible to contribute under the Plan, contributions in any year will be required in respect of all earnings between the contributory earnings lower and upper limits for that year.

The initial rate of contribution as respects earnings subject to contributions will be 1.8 per cent of salary and wages for each of workers and their employers and 3.6 per cent of self-employed earnings.

III. SHORT-RANGE ESTIMATES (1966 TO 1975)

1. *Principal Assumptions*

(a) The effective dates of the Plan will be

(i) for contributions — January, 1966

(ii) for payment of age retirement pensions — January, 1967

(iii) for payment of survivors' benefits (including disabled survivors' pensions) — February, 1968

(iv) for payment of disability pensions — May, 1970

(b) Age retirement pensions will become available to contributors aged 68 or over in 1967, aged 67 or over in 1968, aged 66 or over in 1969 and aged 65 or over in 1970 and after.

(c) Age retirement pensions, lump-sum death benefits and pensions to survivors and disabled persons will be paid in accordance with the assumptions described in Appendices 4, 5 and 6 to this report.

(d) Average earnings will increase at an average rate of

(i) 3 per cent per annum, or

(ii) 4 per cent per annum.

(e) The Consumer Price Index and, consequently, the elements dependent for adjustment on that index, will increase at an average rate of 1½ per cent per annum.

(f) The contributory earnings upper and lower limits will be $5,000 and $600, respectively, for 1966 and 1967, and will increase thereafter to 1975 at a rate of 1½ per cent per annum.

(g) Populations, rates of participation in employment covered by the Plan and average earnings will be as described in Appendices 1, 2 and 3 to this report.

(h) Expenses of administration will be 0.1 per cent of contributory earnings.

(i) For contribution rate purposes, contributions will be paid both on salary and wages and on self-employed earnings at the time such earnings are received by the contributor.

(j) For the fund projections, contributions will be paid on salary and wages at the time such earnings are received and on self-employed earnings in five equal instalments—one at the end of each of March, June, September and December of the year in which such earnings are received and one at the end of March of the following year.

2. *Tables of Financial Estimates*

(a) The estimates shown in Tables 1 to 4 below are based on the assumption that average earnings will increase at an average rate of 3 per cent per annum.

TABLE 1

CONTRIBUTIONS EQUIVALENT TO 1% OF CONTRIBUTORY EARNINGS—BASED ON 3% ANNUAL RATE OF INCREASE IN EARNINGS
(in millions)

Calendar Year	From Salary and Wages			From Self-employed Earnings			Grand Total
	Male	Female	Total	Male	Female	Total	
	$	$	$	$	$	$	$
1966	79.5	25.4	104.9	15.4	1.3	16.7	121.6
1967	82.5	26.7	109.2	16.5	1.4	17.9	127.1
1968	85.7	28.0	113.7	17.7	1.5	19.2	132.9
1969	88.9	29.4	118.3	18.9	1.5	20.4	138.7
1970	92.3	30.9	123.2	19.6	1.6	21.2	144.4
1971	95.8	32.3	128.1	20.4	1.7	22.1	150.2
1972	99.6	33.9	133.5	21.2	1.8	23.0	156.5
1973	103.4	35.5	138.9	22.0	1.9	23.9	162.8
1974	107.6	37.1	144.7	22.9	2.0	24.9	169.6
1975	111.7	38.8	150.5	23.7	2.0	25.7	176.2

TABLE 2

BENEFITS AND EXPENSES OF ADMINISTRATION—BASED ON 3% ANNUAL RATE OF INCREASE IN EARNINGS
(in millions)

Calendar Year	Age Retirement Pensions		Disability Pensions		Survivors' Pensions		Death Benefits		Expenses of Administration	Total
	Male	Female	Male	Female	Widows	Orphans	Male	Female		
	$	$	$	$	$	$	$	$	$	$
1966	..	..	..	..	..	..	..	..	12.2	12.2
1967	1.3	0.2	..	..	..	..	..	..	12.7	14.2
1968	4.1	0.8	..	..	5.1	3.1	9.8	1.4	13.3	37.6
1969	11.7	2.4	..	..	10.7	9.0	10.8	1.5	13.9	60.0
1970	25.2	5.0	5.8	1.5	18.3	14.5	11.7	1.6	14.4	98.0
1971	38.6	7.8	33.2	8.6	28.1	19.7	12.7	1.8	15.0	165.5
1972	55.8	11.5	37.3	9.6	40.1	24.5	13.8	1.9	15.7	210.2
1973	76.9	16.5	41.5	10.7	54.0	29.0	14.8	2.1	16.3	261.8
1974	102.5	22.6	45.7	11.8	70.2	33.2	16.0	2.3	17.0	321.3
1975	132.6	30.1	49.9	12.9	88.5	37.1	17.2	2.5	17.6	388.4

TABLE 3

PERCENTAGES OF CONTRIBUTORY EARNINGS REQUIRED TO PROVIDE BENEFITS AND EXPENSES OF ADMINISTRATION—BASED ON 3% ANNUAL RATE OF INCREASE IN EARNINGS

Calendar Year	Percentage of Contributory Earnings
	%
1966	0.10
1967	0.11
1968	0.28
1969	0.43
1970	0.68
1971	1.10
1972	1.34
1973	1.61
1974	1.89
1975	2.20

TABLE 4

FUND PROJECTIONS—BASED ON 3% ANNUAL RATE OF INCREASE IN EARNINGS
(in millions)

Calendar Year	Contributions (3.6% of contributory earnings)	Benefits and Expenses of Administration	Fund at End of Year	
			Without interest	With interest at 5% per annum
	$	$	$	$
1966	425.7	12.2	413.5	423.4
1967	456.7	14.2	856.0	897.9
1968	477.5	37.6	1,295.9	1,393.4
1969	498.5	60.0	1,734.4	1,912.2
1970	519.3	98.0	2,155.7	2,439.2
1971	540.1	165.5	2,530.3	2,944.9
1972	562.8	210.2	2,882.9	3,453.1
1973	585.4	261.8	3,206.5	3,957.2
1974	609.8	321.3	3,495.0	4,450.4
1975	633.7	388.4	3,740.3	4,924.1

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(b) The estimates shown in Tables 5 to 8 below are based on the assumption that average earnings will increase at an average rate of 4 per cent per annum.

TABLE 5

CONTRIBUTIONS EQUIVALENT TO 1% OF CONTRIBUTORY EARNINGS—BASED ON 4% ANNUAL RATE OF INCREASE IN EARNINGS
(in millions)

Calendar Year	From Salary and Wages			From Self-employed Earnings			Grand Total
	Male	Female	Total	Male	Female	Total	
	$	$	$	$	$	$	$
1966	79.5	25.4	104.9	15.4	1.3	16.7	121.6
1967	82.8	26.9	109.7	16.6	1.4	18.0	127.7
1968	86.3	28.4	114.7	17.8	1.5	19.3	134.0
1969	89.9	30.0	119.9	19.1	1.5	20.6	140.5
1970	93.6	31.7	125.3	19.9	1.6	21.5	146.8
1971	97.5	33.4	130.9	20.8	1.8	22.6	153.5
1972	101.7	35.3	137.0	21.6	1.9	23.5	160.5
1973	106.0	37.2	143.2	22.6	2.0	24.6	167.8
1974	110.6	39.1	149.7	23.5	2.1	25.6	175.3
1975	115.3	41.1	156.4	24.5	2.1	26.6	183.0

TABLE 6

BENEFITS AND EXPENSES OF ADMINISTRATION—BASED ON 4% ANNUAL RATE OF INCREASE IN EARNINGS
(in millions)

Calendar Year	Age Retirement Pensions		Disability Pensions		Survivors' Pensions		Death Benefits		Expenses of Administration	Total
	Male	Female	Male	Female	Widows	Orphans	Male	Female		
	$	$	$	$	$	$	$	$	$	$
1966	..	..	..	..	..	..	..	..	12.2	12.2
1967	1.3	0.2	..	..	..	..	..	..	12.8	14.3
1968	4.1	0.8	..	..	5.1	3.1	9.8	1.4	13.4	37.7
1969	11.7	2.4	..	..	10.7	9.0	10.8	1.5	14.1	60.2
1970	25.3	5.0	5.8	1.5	18.3	14.5	11.7	1.6	14.7	98.4
1971	38.7	7.9	33.3	8.6	28.2	19.7	12.7	1.8	15.4	166.3
1972	56.0	11.6	37.4	9.7	40.2	24.5	13.8	1.9	16.1	211.2
1973	77.2	16.7	41.6	10.9	54.2	29.0	14.9	2.1	16.8	263.4
1974	102.9	22.9	45.8	11.9	70.5	33.2	16.1	2.3	17.5	323.1
1975	133.3	30.5	50.1	13.0	88.9	37.1	17.3	2.5	18.3	391.0

TABLE 7

PERCENTAGES OF CONTRIBUTORY EARNINGS REQUIRED TO PROVIDE BENEFITS AND EXPENSES OF ADMINISTRATION—BASED ON 4% ANNUAL RATE OF INCREASE IN EARNINGS

Calendar Year	Percentage of Contributory Earnings
	%
1966	0.10
1967	0.11
1968	0.28
1969	0.43
1970	0.67
1971	1.08
1972	1.32
1973	1.57
1974	1.84
1975	2.14

TABLE 8

FUND PROJECTIONS—BASED ON 4% ANNUAL RATE OF INCREASE IN EARNINGS
(in millions)

Calendar Year	Contributions (3.6% of contributory earnings)	Benefits and Expenses of Administration	Fund at End of Year	
			Without interest	With interest at 5% per annum
	$	$	$	$
1966	425.7	12.2	413.5	423.4
1967	458.7	14.3	857.9	899.8
1968	481.5	37.7	1,301.7	1,399.4
1969	504.8	60.2	1,746.3	1,924.8
1970	527.8	98.4	2,175.7	2,460.8
1971	551.8	166.3	2,561.2	2,978.6
1972	577.2	211.2	2,927.2	3,502.4
1973	603.2	263.4	3,267.0	4,025.4
1974	630.3	323.1	3,574.2	4,541.3
1975	658.0	391.0	3,841.2	5,041.7

IV. LONG-RANGE ESTIMATES

1. *Principal Assumptions*

(a) Age retirement pensions, lump-sum death benefits and pensions to survivors and disabled persons will be paid in accordance with the assumptions described in Appendices 4, 5 and 6 to this report.

(b) Average earnings will increase at an average rate of (i) 3 per cent per annum, or (ii) 4 per cent per annum.

(c) For the "low cost" estimates, the Consumer Price Index and, consequently, the elements dependent for adjustment on that index, will increase at an average rate of 1½ per cent per annum.

(d) For the "high cost" estimates, the Consumer Price Index and, consequently, the elements dependent for adjustment on that index, will increase at an average rate of 1½ per cent per annum until 1975 and 2 per cent per annum thereafter.

(e) The contributory earnings upper and lower limits will be $5,000 and $600, respectively, for 1966 and 1967, will increase thereafter to 1975 at a rate of 1½ per cent per annum and will increase after 1975 at a rate of (i) 3 per cent per annum, or (ii) 4 per cent per annum.

(f) Populations, rates of participation in employment covered by the Plan and average earnings will be as described in Appendices 1, 2 and 3 to this report.

(g) The rate of contribution on self-employed earnings will be equal to the combined worker-employer rate on salary and wages.

(h) Expenses of administration will be 0.1 per cent of contributory earnings.

(i) For the fund projections, interest will be earned on the balance of the Account from time to time at a rate of 5 per cent per annum from the effective date of the Plan to the end of 1975 and at a rate of 4 per cent per annum thereafter.

2. *Required Contribution Rates and Fund Projections*

In Tables 9 and 10 below are shown, for quinquennial years from 1980 to 2050, the estimated rates of contribution that would be required to provide benefits on a strictly "pay-as-you-go" basis, that is, in accordance with the assumption that there would be no fund available and therefore no interest income available to meet a part of the cost of benefits payable. The estimates in Table 9 are based on the assumption that average earnings will increase at an average rate of 3 per cent per annum and those in Table 10 on the assumption that such rate of increase will be 4 per cent per annum.

In Table 11 below are shown what are termed "intermediate cost" estimates, being percentages determined simply by dividing the sum of

the estimated "high cost" and "low cost" benefits and expenses of administration for quinquennial years by the sum of the estimated "high cost" and "low cost" contributory earnings for the corresponding years.

In Table 12 below is shown how the fund would develop in accordance with the different sets of estimates.

TABLE 9

PERCENTAGES OF CONTRIBUTORY EARNINGS REQUIRED TO PROVIDE BENEFITS AND EXPENSES OF ADMINISTRATION—BASED ON 3% ANNUAL RATE OF INCREASE IN EARNINGS

Calendar Year	Age Retirement Pensions	Disability Pensions	Survivors' Pensions			Death Benefits	Expenses of Administration	Total
			Widows	Orphans	Total			
	%	%	%	%	%	%	%	%
HIGH COST								
1980	2.00	0.45	0.81	0.24	1.05	0.13	0.10	3.73
1985	2.76	0.47	1.07	0.23	1.30	0.15	0.10	4.78
1990	3.34	0.46	1.27	0.21	1.48	0.16	0.10	5.55
1995	3.67	0.44	1.38	0.18	1.56	0.18	0.10	5.95
2000	3.70	0.44	1.45	0.15	1.60	0.18	0.10	6.02
2005	3.53	0.46	1.48	0.13	1.61	0.18	0.10	5.88
2010	3.42	0.49	1.52	0.11	1.63	0.19	0.10	5.83
2015	3.66	0.51	1.57	0.09	1.66	0.19	0.10	6.12
2020	4.16	0.52	1.66	0.09	1.75	0.20	0.10	6.73
2025	4.70	0.52	1.77	0.08	1.85	0.22	0.10	7.39
2030	5.11	0.53	1.90	0.08	1.98	0.24	0.10	7.96
2035	5.40	0.54	2.02	0.07	2.09	0.26	0.10	8.39
2040	5.69	0.55	2.15	0.07	2.22	0.27	0.10	8.83
2045	6.05	0.54	2.26	0.07	2.33	0.28	0.10	9.30
2050	6.40	0.53	2.37	0.06	2.43	0.30	0.10	9.76
LOW COST								
1980	1.84	0.44	0.74	0.25	0.99	0.13	0.10	3.50
1985	2.42	0.44	0.91	0.25	1.16	0.14	0.10	4.26
1990	2.85	0.44	1.04	0.23	1.27	0.15	0.10	4.81
1995	3.10	0.42	1.11	0.20	1.31	0.15	0.10	5.08
2000	3.06	0.41	1.12	0.18	1.30	0.15	0.10	5.02
2005	2.88	0.41	1.09	0.16	1.25	0.15	0.10	4.79
2010	2.73	0.42	1.05	0.14	1.19	0.14	0.10	4.58
2015	2.79	0.41	1.04	0.13	1.17	0.14	0.10	4.61
2020	2.93	0.40	1.03	0.12	1.15	0.14	0.10	4.72
2025	3.02	0.39	1.01	0.11	1.12	0.15	0.10	4.78
2030	3.02	0.39	1.00	0.10	1.10	0.15	0.10	4.76
2035	2.99	0.38	0.99	0.10	1.09	0.15	0.10	4.71
2040	2.99	0.38	0.99	0.09	1.08	0.15	0.10	4.70
2045	3.01	0.38	0.98	0.08	1.06	0.15	0.10	4.70
2050	3.03	0.37	0.98	0.08	1.06	0.15	0.10	4.71

TABLE 10

PERCENTAGES OF CONTRIBUTORY EARNINGS REQUIRED TO PROVIDE BENEFITS AND EXPENSES OF ADMINISTRATION—BASED ON 4% ANNUAL RATE OF INCREASE IN EARNINGS

Calendar Year	Age Retirement Pensions	Disability Pensions	Survivors' Pensions			Death Benefits	Expenses of Administration	Total
			Widows	Orphans	Total			
	%	%	%	%	%	%	%	%
HIGH COST								
1980	1.88	0.43	0.75	0.22	0.97	0.13	0.10	3.51
1985	2.56	0.44	0.96	0.21	1.17	0.14	0.10	4.41
1990	3.08	0.43	1.11	0.18	1.29	0.16	0.10	5.06
1995	3.36	0.41	1.19	0.14	1.33	0.16	0.10	5.36
2000	3.37	0.40	1.23	0.12	1.35	0.16	0.10	5.38
2005	3.21	0.42	1.24	0.09	1.33	0.16	0.10	5.22
2010	3.11	0.45	1.26	0.07	1.33	0.17	0.10	5.16
2015	3.36	0.46	1.29	0.06	1.35	0.17	0.10	5.44
2020	3.84	0.46	1.36	0.06	1.42	0.19	0.10	6.01
2025	4.35	0.46	1.45	0.05	1.50	0.20	0.10	6.61
2030	4.72	0.47	1.56	0.04	1.60	0.22	0.10	7.11
2035	4.97	0.48	1.66	0.04	1.70	0.23	0.10	7.48
2040	5.23	0.48	1.76	0.04	1.80	0.25	0.10	7.86
2045	5.56	0.48	1.85	0.03	1.88	0.26	0.10	8.28
2050	5.87	0.47	1.94	0.03	1.97	0.27	0.10	8.68
LOW COST								
1980	1.74	0.42	0.69	0.23	0.92	0.12	0.10	3.30
1985	2.25	0.42	0.82	0.22	1.04	0.13	0.10	3.94
1990	2.63	0.41	0.91	0.19	1.10	0.14	0.10	4.38
1995	2.85	0.39	0.95	0.16	1.11	0.14	0.10	4.59
2000	2.80	0.37	0.95	0.14	1.09	0.14	0.10	4.50
2005	2.63	0.38	0.92	0.11	1.03	0.13	0.10	4.27
2010	2.50	0.38	0.87	0.10	0.97	0.13	0.10	4.08
2015	2.56	0.37	0.86	0.09	0.95	0.13	0.10	4.11
2020	2.71	0.36	0.85	0.07	0.92	0.13	0.10	4.22
2025	2.79	0.35	0.83	0.07	0.90	0.14	0.10	4.28
2030	2.79	0.35	0.83	0.06	0.89	0.14	0.10	4.27
2035	2.75	0.35	0.83	0.05	0.88	0.14	0.10	4.22
2040	2.75	0.34	0.82	0.05	0.87	0.14	0.10	4.20
2045	2.78	0.34	0.81	0.04	0.85	0.14	0.10	4.21
2050	2.80	0.34	0.81	0.04	0.85	0.14	0.10	4.23

TABLE 11

"INTERMEDIATE COST" ESTIMATES—REQUIRED PERCENTAGES OF CONTRIBUTORY EARNINGS

Calendar Year	Rate of Increase in Average Earnings	
	3% per annum	4% per annum
	%	%
1980	3.61	3.40
1985	4.50	4.16
1990	5.15	4.69
1995	5.47	4.94
2000	5.46	4.88
2005	5.25	4.67
2010	5.10	4.53
2015	5.21	4.64
2020	5.48	4.90
2025	5.71	5.11
2030	5.83	5.21
2035	5.86	5.23
2040	5.89	5.26
2045	5.93	5.29
2050	5.95	5.31

TABLE 12

FUND PROJECTIONS
(in billions)

End of Calendar Year	Rate of Increase in Average Earnings					
	3% per annum			4% per annum		
	High Cost	Low Cost	Intermediate Cost	High Cost	Low Cost	Intermediate Cost
	$	$	$	$	$	$
1975	4.9	4.9	4.9	5.0	5.0	5.0
1980	6.5	6.7	6.6	6.8	7.1	7.0
1985	6.7	7.5	7.1	7.5	8.4	8.0
1990	5.0	6.9	5.9	6.4	8.6	7.5
1995	0.8	4.4	2.6	2.9	7.1	5.0
2000	−6.2	−0.1	−3.2	− 3.4	4.1	0.3
2005				−12.9	−0.2	−6.5

It will be noted from Tables 9 and 10 above that the "high cost" percentages of contributory earnings estimated to be required to provide for benefits and expenses of administration show an almost unbroken

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upward trend over the whole period covered by the estimates. The main reason for this trend is that, for the populations projected in accordance with the low fertility—low immigration (high cost) assumptions, the proportion of the "dependent" to the "productive" population increases almost continuously over the period. Since this proportion will have almost reached its limit by 2050, it follows that the "high cost" percentages will have almost reached their limit at the same time.

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Chief Actuary,
Department of Insurance

Ottawa, Canada
November 6, 1964

APPENDIX 1

Population Projections

1. *General*

Population projections were carried out for all of Canada and for the province of Quebec separately and the populations required for the financial estimates for Canada excluding Quebec were obtained simply by subtracting from the projected populations for all of Canada the corresponding projected populations for Quebec. So that as much information as possible would be available to interested persons, pertinent assumptions are described and resulting populations are tabulated hereinafter for all of Canada and for Quebec separately.

The three factors affecting population are mortality, fertility and net migration. Because of the wide variation possible in future fertility rates and in numbers of "net" immigrants, it was decided to make "low" and "high" assumptions in respect of each of these factors and, starting with the 1961 Census populations, to develop two series of populations, one based on low fertility—low immigration assumptions and the other on high fertility—high immigration assumptions. For purposes of the long-range estimates, populations were developed for each quinquennial year from 1965 to 2050. (It may be noted here that the projected populations based on low fertility—low immigration assumptions yield "high cost" estimates and those based on high fertility—high immigration assumptions yield "low cost" estimates.)

For the short range, populations for each year 1965 to 1975 were developed by interpolation methods from the long-range low fertility—low immigration populations for 1961, 1965, 1970 and 1975. (Fertility, of course, has no effect on short-range costs.)

It is important to keep in mind that the population projections were made in conformance with the objective of producing cost estimates that, for the long term, are upper and lower limits. Thus, the projected populations are not attempted forecasts of what the actual populations will be in future years. It is, however, reasonable to assume that actual future populations will lie somewhere between the low and high projected populations.

In the following sections are described the basic assumptions made, rates and other factors developed in accordance with those assumptions, the general methods used for the projections and the resulting populations.

2. *Mortality*

Many different approaches have been used in the prediction of future population mortality experience.

The Division of the Actuary of the Social Security Administration of the United States Department of Health, Education, and Welfare, recently used a novel approach in the development of projected mortality

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rates for use in projections of the U.S. population for the purposes of the Old-Age, Survivors, and Disability Insurance program. Very briefly and very generally, groups of medical and health statisticians examined each of the main causes of death individually and predicted, for each sex and age group, how the probability of death from each such cause would change between now and the year 2000. From these ratios were estimated the changes resulting from all causes, and mortality rates and survivorship factors for the year 2000 were determined by applying these combined ratios to current factors. It was assumed that mortality would remain constant after the year 2000.

The Government Actuary's Department of Great Britain, for the Second Quinquennial Review of The National Insurance Acts, predicted future mortality rates for use in projections of the British population. For these forecasts, it was assumed that at ages under 45, 1953-57 mortality rates would decrease by about one-half over a 25-year period, and for ages over 45 the rates of decline would become progressively smaller with increasing age. For all ages, it was assumed that mortality would remain constant after 1983.

The method initially established for the development of future mortality rates applicable for the population of all of Canada was based on the general assumption that mortality would continue to improve for each age in the future at the rate that applied over the period from 1931 to 1956. However, rates produced in accordance with this method were not generally reasonable for the younger ages where mortality as a result of communicable diseases is now very low and mortality as a result of accidents is unlikely to improve a great deal in the future. As a result, the level of the rates initially developed for the younger ages for application in the year 2000 and after were adjusted upwards, keeping in mind the general levels of the rates forecast by the U.S. and British actuaries for the population projections mentioned above. Minor adjustments were made for some of the higher age groups.

In Schedule 1 below is given, for specimen ages, a comparison of the mortality rates developed for the current population projections for all of Canada as applicable for the year 2000 and after with the average of the low and high rates predicted as applicable for the U.S. population for the year 2000 and after and with the rates predicted as applicable for the British population for the year 1983 and after. (*Note*: The U.S. and British rates are not exact—they were read from graphs drawn through or near specimen rates that were immediately available in published reports.)

In Schedule 2 below is given, for specimen ages, a comparison of mortality rates from the Canadian Life Tables 1930-32, 1940-42, 1950-52 and 1960-62 with the rates forecast for the year 2000 and after.

In Schedule 3 below is given, for specimen ages, a comparison of mortality rates from the Canadian Life Tables 1950-52 and 1960-62 with mortality rates from the corresponding Quebec Life Tables.

SCHEDULE 1

PROJECTED POPULATION MORTALITY RATES

(per 1,000 persons)

Age	United States (average of high and low rates for year 2000 and after)		Great Britain (rates for year 1983 and after)		Canada (rates for year 2000 and after)	
	Male	Female	Male	Female	Male	Female
0	15.44	12.06	13.10	10.20	13.00	10.00
1	1.15	.95	.61	.50	1.00	.81
2	.92	.75	.50	.43	.88	.68
3	.75	.60	.41	.37	.77	.57
4	.62	.48	.34	.31	.67	.48
5	.52	.39	.28	.27	.59	.41
7	.38	.27	.20	.20	.46	.31
10	.32	.21	.17	.14	.34	.23
12	.38	.24	.21	.13	.31	.21
15	.74	.35	.31	.15	.31	.21
17	1.21	.43	.38	.18	.35	.23
20	1.49	.52	.45	.24	.45	.29
25	1.44	.61	.49	.34	.71	.46
30	1.37	.73	.55	.44	1.08	.71
35	1.58	1.02	.75	.59	1.57	1.05
40	2.67	1.62	1.26	.92	2.22	1.51
45	4.65	2.53	2.43	1.61	3.19	2.17
50	7.12	3.78	5.35	2.93	5.18	3.15
55	11.27	5.45	10.50	4.67	9.14	4.61
60	16.90	8.20	17.80	7.50	15.52	7.22
65	24.10	12.50	28.70	13.80	24.76	12.65
70	35.50	21.40	45.30	25.30	38.39	22.81
75	56.10	40.20	73.80	46.30	60.14	40.33
80	90.40	71.60	119.50	83.00	96.56	68.60
85	141.80	118.50	190.50	151.70	151.41	110.73
90	209.80	183.00	288.80	265.00	226.12	168.42

SCHEDULE 2

CANADIAN POPULATION MORTALITY RATES

(per 1,000 persons)

Age	Males					Females				
	1931	1941	1951	1961	2000 and after	1931	1941	1951	1961	2000 and after
0	86.95	62.50	43.25	30.58	13.00	69.31	49.31	34.23	23.87	10.00
1	11.87	7.21	3.41	1.85	1.00	10.80	6.34	2.99	1.64	.81
2	5.96	3.98	1.80	1.14	.88	4.96	3.26	1.54	.96	.68
3	4.11	2.94	1.59	.99	.77	3.74	2.62	1.14	.71	.57
4	3.16	2.34	1.18	.83	.67	2.90	1.94	.92	.61	.48
5	2.62	1.98	1.01	.73	.59	2.32	1.57	.79	.53	.41
10	1.60	1.22	.77	.50	.34	1.40	.90	.52	.29	.23
15	2.07	1.63	1.12	.89	.31	1.95	1.22	.67	.40	.21
20	3.08	2.41	1.72	1.53	.45	2.95	1.80	.91	.55	.29
25	3.40	2.57	1.82	1.57	.71	3.67	2.31	1.06	.64	.46
30	3.41	2.60	1.89	1.50	1.08	3.98	2.60	1.29	.79	.71
35	3.98	3.17	2.27	1.93	1.57	4.48	3.14	1.77	1.15	1.05
40	4.94	4.28	3.28	2.82	2.22	5.12	3.86	2.57	1.74	1.51
45	6.30	5.98	5.24	4.65	3.19	6.15	5.04	3.87	2.77	2.17
50	9.03	8.95	8.53	7.72	5.18	8.04	7.01	5.60	4.36	3.15
55	13.29	13.46	13.48	12.65	9.14	11.62	10.42	8.34	6.75	4.61
60	19.38	20.29	20.71	19.99	15.52	17.14	15.28	13.08	10.64	7.22
65	29.75	30.90	30.04	29.72	24.76	26.03	24.26	20.40	17.18	12.65
70	46.34	47.59	44.35	44.67	38.39	40.57	38.12	33.08	27.74	22.81
75	74.03	75.47	69.38	67.06	60.14	67.35	63.58	55.67	46.64	40.33
80	115.27	117.38	108.46	100.91	96.56	107.69	101.96	92.22	79.41	68.60
85	171.67	174.04	163.53	152.31	151.41	160.86	157.76	146.37	131.18	110.73
90	247.11	250.42	236.67	227.12	226.12	228.60	233.91	221.83	207.08	168.42
95	344.54	351.67	329.97	331.23	323.79	312.27	328.52	322.29	312.26	242.13

SCHEDULE 3

COMPARISON OF MORTALITY RATES FOR QUEBEC AND FOR ALL OF CANADA
(per 1,000 persons)

Age	Life Tables, 1950–52			Life Tables, 1960–62		
	Quebec	Canada	Ratio of Quebec Rates to Canada Rates	Quebec	Canada	Ratio of Quebec Rates to Canada Rates
MALES			%			%
0	55.38	43.25	128.0	34.90	30.58	114.1
1	4.32	3.41	126.7	2.11	1.85	114.1
2	1.97	1.80	109.4	1.31	1.14	114.9
3	1.88	1.59	118.2	1.23	.99	124.2
4	1.38	1.18	116.9	1.06	.83	127.7
5	1.15	1.01	113.9	.93	.73	127.4
10	.85	.77	110.4	.59	.50	118.0
20	1.74	1.72	101.2	1.50	1.53	98.0
30	2.09	1.89	110.6	1.50	1.50	100.0
40	3.59	3.28	109.5	3.15	2.82	111.7
50	9.61	8.53	112.7	8.29	7.72	107.4
60	22.83	20.71	110.2	21.56	19.99	107.9
70	48.37	44.35	109.1	47.06	44.67	105.4
80	113.80	108.46	104.9	104.95	100.91	104.0
90	246.21	236.67	104.0	244.10	227.12	107.5
FEMALES						
0	43.84	34.23	128.1	27.19	23.87	113.9
1	3.79	2.99	126.8	1.86	1.64	113.4
2	1.71	1.54	111.0	1.10	.96	114.6
3	1.23	1.14	107.9	.85	.71	119.7
4	1.05	.92	114.1	.77	.61	126.2
5	.93	.79	117.7	.67	.53	126.4
10	.55	.52	105.8	.34	.29	117.2
20	1.01	.91	111.0	.55	.55	100.0
30	1.65	1.29	127.9	.82	.79	103.8
40	3.12	2.57	121.4	1.93	1.74	110.9
50	6.39	5.60	114.1	4.63	4.36	106.2
60	15.25	13.08	116.6	12.27	10.64	115.3
70	38.09	33.08	115.1	31.60	27.74	113.9
80	98.58	92.22	106.9	86.85	79.41	109.4
90	257.83	221.83	116.2	234.59	207.08	113.3

Although current mortality in Quebec is somewhat higher than that in all of Canada, the difference in the levels of mortality has been decreasing over past years, as generally indicated in Schedule 3 above. It was consequently decided that the ultimate rates assumed to be applicable for the Canadian population for the year 2000 and after could also be taken as applicable for the corresponding Quebec population.

In application of the mortality rates in the population projections for both all of Canada and Quebec, five-year survivorship ratios for five-year age groups were computed on the basis of the mortality rates of the 1950-52 and 1955-57 Life Tables and the projected mortality rates for the year 2000 and after, and survivorship ratios for each intermediate five-year period were obtained by interpolation. The survivorship ratios so developed were applied to successive quinquennial populations.

3. *Fertility*

The underlying statistics referred to in this section were drawn mainly from the "Vital Statistics" publications of the Dominion Bureau

of Statistics. (The latest issue available at the time the population projections were made was the issue for the year 1960.)

Forecasts of future fertility are even less predictable than forecasts of future mortality. For all of Canada, the birth rate, that is, the number of live births per 1,000 of total population, has varied widely over the years. After World War I, it was very high (29.3 for 1921) but decreased through the following sixteen years to a low of 20.1 for 1937. After 1937, it increased gradually to 24.3 for 1945. From 1946 to 1959, it was never below 27. For the years 1960, 1961, 1962 and 1963 it was 26.8, 26.1, 25.3 and 24.6, respectively.

Canadian birth rates are currently considerably higher than those for almost all other developed countries. Compared to a Canadian birth rate of 26.8, the 1960 birth rates for a few selected countries were:

United States	23.9
England and Wales	17.1
Ireland	21.4
Scotland	19.4
Australia	22.4
New Zealand	26.5
France	17.9
German Federal Republic	17.7
Italy	18.5
USSR (1959)	25.0

In the published description of the 1957 U.S. population projections, it was stated

> "Previous estimates of future fertility have generally been too low . . . . . It seems clear that a decrease must eventually occur, since the population cannot go on increasing indefinitely. If present fertility rates continued to the year 2050, the total United States population would be over a billion. The important question is when a decline will begin and how rapid it will be."

The low fertility assumptions used for the 1957 U.S. population projections were, generally, that current fertility rates would decrease to rates that would produce a gross reproduction rate of 1 for the period 2005-2010 and later. The high fertility assumptions were that a gross reproduction rate of 1 would prevail for the period 2045-2050 and later. (A "gross reproduction rate of 1" means that if all females born alive survived to the end of the child-bearing period, they would, on the average, have had one female child. The consequence of an assumption of a gross reproduction rate of 1 would be that, with no net immigration, the population would decrease as time went on because not all females born alive survive to the end of their child-bearing years.)

The persons who were responsible for the U.S. projections apparently believed that the idea of a U.S. population of a billion or more is not reasonable. However, even if this consideration should be valid for the U.S., the same consideration would not apply to Canada for the foreseeable future. From an examination of U.S. fertility rates, it would seem that, if current U.S. rates would increase a U.S. population of 180 million to over a billion in about 100 years, the same rates would increase a Canadian population of 18 million to over 100 million in the same period. On the surface, at least, such a population for Canada does not seem unreasonable, considering the land and resources available.

The fertility assumptions chosen for the projections of the population of all of Canada were as follows:

(a) the high fertility assumption was that the average of fertility rates for all of Canada for the period 1956 to 1960, inclusive, will apply throughout the future; and

(b) the low fertility assumption was that the average described in (a) above will decrease linearly into fertility rates that produce a net reproduction rate of 1 for the period 2000-2004 and later. (A "net reproduction rate of 1" means that, on the average, every female born alive will bear one female child.)

In Schedule 4 below are shown the fertility rates computed in accordance with the above assumptions. In Schedule 5 below are shown the gross and net reproduction rates corresponding to the fertility rates listed in Schedule 4.

SCHEDULE 4

FERTILITY RATES USED FOR PROJECTION OF THE POPULATION OF ALL OF CANADA

(number of live births per 1,000 females in age group)

Female Age Group	High Fertility (average of rates for 1956-60 period)	Low Fertility (for year 2000 and after)
15-19	59.2	31.9
20-24	226.8	122.0
25-29	225.1	121.1
30-34	148.6	79.9
35-39	89.0	47.9
40-44	29.3	15.8
45-49	2.7	1.5

SCHEDULE 5

REPRODUCTION RATES FOR ALL OF CANADA

Type of Rate	High Fertility		Low Fertility	
	For current period	For year 2000 and after	For current period	For year 2000 and after
Gross Reproduction Rate	1.898	1.898	1.898	1.021
Net Reproduction Rate*	1.811	1.859	1.811	1.000

*A "net reproduction rate" depends on female mortality as well as fertility assumptions. The "current" net reproduction rate was based on the female mortality rates of the Canadian Life Table, 1955-1957, and the ultimate rates were based on the projected female mortality rates for the year 2000 and after.

For Quebec, both the pattern and level of fertility rates have been considerably different from those for all of Canada. In Schedule 6 below are compared, for specimen years, fertility rates for all of Canada and for Quebec.

SCHEDULE 6

COMPARISON OF FERTILITY RATES FOR ALL OF CANADA AND FOR QUEBEC

(number of live births per 1,000 females)

Female Age Group	1941 Rates		1951 Rates		1961 Rates	
	Canada	Quebec	Canada	Quebec	Canada	Quebec
15-19	30.7	21.5	48.1	29.2	58.2	31.5
20-24	138.4	137.7	188.7	176.0	233.6	198.6
25-29	159.8	189.9	198.8	217.3	219.2	216.8
30-34	122.3	157.4	144.5	170.3	144.9	155.9
35-39	80.0	114.3	86.5	113.3	81.1	96.3
40-44	31.6	50.6	30.9	44.2	28.5	37.3
45-49	3.7	6.5	3.1	4.7	2.4	3.6

The fertility assumptions chosen for the projection of the Quebec population were of the same pattern as those chosen for all of Canada. Specifically,

(a) the high fertility assumption was that the average of Quebec fertility rates for the period 1956 to 1960, inclusive, will apply throughout the future, and

(b) the low fertility assumption was that the average described in (a) above will decrease linearly into fertility rates that produce a net reproduction rate of 1 for the period 2000-2004 and later.

In Schedule 7 below are shown the fertility rates computed in accordance with the above assumptions.

SCHEDULE 7

FERTILITY RATES USED FOR PROJECTION OF THE POPULATION OF QUEBEC

(number of live births per 1,000 females)

Female Age Group	High Fertility (average of rates for 1956-60 period)	Low Fertility (for year 2000 and after)
15-19	33.7	18.2
20-24	199.9	107.9
25-29	229.9	124.1
30-34	165.8	89.5
35-39	108.2	58.4
40-44	39.9	21.5
45-49	3.9	2.1

Consideration of the radical difference between the high and low rates set out in Schedules 4 and 7 makes it evident that populations projected in accordance with the high fertility assumptions will, in the long run, become many times greater than the corresponding populations projected in accordance with the low fertility assumptions.

96046—6

In application of the fertility rates in the population projections for both all of Canada and Quebec, age-group fertility rates to produce number of female births were computed for each future quinary period and the number of male births for each quinquennium was then determined as the number of female births multiplied by the factor 1.057 for all of Canada and 1.059 for Quebec (that is, the respective averages of the annual ratios of male to female births in all of Canada and in Quebec over the period from 1951 to 1960, inclusive).

4. *Immigration*

The underlying statistics referred to in this section were drawn mainly from the "Immigration" statistical booklets prepared annually by the Department of Citizenship and Immigration.

Immigration is the least predictable of the three factors entering into Canadian population projections. Net immigration from time to time depends on social and economic conditions prevailing not only in Canada but in the world at large and, at least over limited periods, on immigration policies which may change from government to government or even from year to year. The following quotation from the Canada Year Book, 1962, illustrates how social circumstances may be reflected in the extent of migration:

> "The Hungarian revolution and the Suez crisis of 1956 had a sharp impact on Canadian immigration in 1957 when 282,164 persons were admitted, including 31,643 from Hungary and 108,989 from the British Isles. This was the largest number of immigrants to enter Canada since 1913."

In Schedule 8 below are shown the numbers of immigrants to Canada for the ten-year period ended in 1962 and the annual average for that period.

SCHEDULE 8

NUMBER OF CANADIAN IMMIGRANTS

Year	Male	Female	Total
1953	91,422	77,446	168,868
1954	84,531	69,696	154,227
1955	56,828	53,118	109,946
1956	89,541	75,316	164,857
1957	154,226	127,938	282,164
1958	60,630	64,221	124,851
1959	51,476	55,452	106,928
1960	51,018	53,093	104,111
1961	32,106	39,583	71,689
1962	34,546	40,040	74,586
AVERAGE 1953-62	70,632	65,590	136,222

No Canadian statistics are available on emigration. However, from U.S. immigration statistics, it is known that annual emigration of Canadians to the U.S., less Canadians returning to Canada after residence in the

U.S., has been about 40,000 for several years in the recent past. Also, it is estimated that the annual number of emigrants to countries other than the U.S. has been of the order of 30,000. It would seem, then, that net immigration to Canada was practically non-existent for the years 1961 and 1962 and may be presumed to have been about 35,000 for each of the preceding two years and to have averaged about 65,000 annually over the ten-year period ended in 1962.

For the purposes of the current population projections the "high" and "low" immigration assumptions used were that the number of net immigrants to Canada for each year throughout the future would be 100,000 and 40,000, respectively. It was also assumed that the annual number of male and female immigrants would be equal. In this regard, it may be noted from Schedule 8 that the average number of male immigrants was considerably higher than the average number of female immigrants over the last ten years but that there were more female than male immigrants in each of the last five years.

Little is known about the age distribution of emigrants from Canada. It was therefore decided to assume that, for males and females separately, the age distributions of future emigrants and immigrants will be the same and that such distributions will follow the average of the yearly averages for immigrants who arrived in Canada over the period from 1956 to 1962, inclusive. In Schedule 9 below are shown the age distributions used for the population projections.

SCHEDULE 9

DISTRIBUTION OF IMMIGRANTS BY AGE GROUP

Age Group	Males	Females
	%	%
0- 4	9.17	8.48
5- 9	8.24	7.56
10-14	6.07	5.45
15-19	8.15	8.17
20-24	18.67	20.68
25-29	17.57	15.80
30-34	11.42	10.38
35-39	7.41	6.61
40-44	4.20	3.83
45-49	3.08	3.23
50-54	2.11	2.79
55-59	1.35	2.30
60-64	.92	1.97
65-69	.83	1.36
70 & over	.81	1.39

For Quebec, as respects internal migration between the provinces, all available information, including that with respect to Family Allowance and Old Age Security payments, indicated that net population movement between Quebec and the other provinces of Canada is not material.

96046—6½

As respects international migration, past experience has been that somewhat fewer than a proportionate number (on a population basis) of net immigrants to Canada have indicated intention to reside in Quebec. However, as may be noted from the statistics shown in Schedule 10 below, there seems to be some slight indication of an upward trend in the proportion of immigrants taking up residence in Quebec.

SCHEDULE 10

COMPARISON OF PROPORTIONS OF TOTAL CANADIAN POPULATION AND TOTAL IMMIGRANTS TO CANADA ACCOUNTED FOR BY QUEBEC POPULATION AND IMMIGRANTS TO QUEBEC, RESPECTIVELY

Year	Population of Canada	Population of Quebec	Ratio of population of Quebec to population of Canada	Number of immigrants to Canada	Number of immigrants taking up residence in Quebec	Ratio of immigrants taking up residence in Quebec to total immigrants
			%			%
1941	11,507,000	3,332,000	29.0	9,329	1,931	20.7
1951	14,009,000	4,056,000	29.0	194,391	46,033	23.7
1961	18,238,000	5,259,000	28.8	71,689	16,920	23.6

For purposes of the estimates, it was thought appropriate to assume that the proportion of future immigrants to Canada who take up residence in Quebec will be the same as the proportion that the 1961 population of Quebec bears to the population of Canada, namely, 28.84 per cent. (If less than a proportionate number of immigrants take up residence in Quebec, the financial estimates for Canada excluding Quebec are slightly overstated.) Thus, on the basis of a high immigration assumption of 100,000 "net" immigrants per year and a low immigration assumption of 40,000 "net" immigrants per year for all of Canada, the high and low immigration assumptions for Quebec were taken to be 28,836 and 11,534 "net" immigrants, respectively, for each future year. It was also assumed that the net annual numbers of immigrants to Quebec would be equally divided between males and females and that the age distributions used for the projections of the population of all of Canada, as shown in Schedule 9 above, would also be applicable for "net" immigrants to Quebec.

In practice, for all of Canada and for Quebec, separately, "high" and "low" immigrant populations, starting with 1961 immigrants, were constructed in accordance with the mortality, fertility and net immigration assumptions described in this and the two preceding sections. These populations were then added to the projected non-immigrant populations constructed from the 1961 Census populations in accordance with the mortality and fertility assumptions described in the two preceding sections to produce total projected populations for all of Canada and for Quebec.

5. *Populations*

In Schedule 11 for all of Canada and in Schedule 15 for Quebec are shown, for males and females and in total, the Census populations for decennial years from 1921 to 1961 and the projected populations under the low fertility—low immigration and high fertility—high immigration assumptions for quinquennial years from 1965 to 2050, inclusive, birth rates computed for future years in accordance with the applicable fertility assumptions, and ratios of the "dependent" population aged 65 and over to the "productive" population aged 20 to 64.

In Schedule 12 (low fertility—low immigration) and Schedule 13 (high fertility—high immigration) for all of Canada and in corresponding Schedules 16 and 17 for Quebec are shown the 1961 Census populations and the projected populations for 1970 and decennial years thereafter to the year 2050 by sex and broad age group and the proportions of total population for each such class.

In Schedule 14 for all of Canada and in Schedule 18 for Quebec are shown estimated populations for each year 1965 to 1974 determined from the 1961, 1965, 1970 and 1975 low fertility—low immigration populations by mathematical interpolation.

SCHEDULE 11

CENSUS AND PROJECTED POPULATIONS FOR ALL OF CANADA
(in thousands)

Middle of Year	Males	Females	Total	Birth rate per 1,000	Proportion of population aged 65 and over to population aged 20 to 64
		LOW FERTILITY—LOW IMMIGRATION			%
1921	4,530	4,258	8,788	29.3	9.3
1931	5,375	5,002	10,377	23.2	10.5
1941	5,901	5,606	11,507	22.4	12.0
1951	7,089	6,921	14,010	27.2	14.3
1961	9,219	9,019	18,238	26.1	15.1
1965	9,912	9,748	19,660	24.3	15.1
1970	10,823	10,701	21,524	23.7	14.8
1975	11,821	11,732	23,553	23.3	15.0
1980	12,890	12,823	25,713	22.5	15.7
1985	13,975	13,921	27,896	21.0	16.4
1990	15,018	14,972	29,990	19.3	17.3
1995	15,991	15,957	31,948	17.7	17.8
2000	16,875	16,837	33,712	16.6	17.1
2005	17,719	17,673	35,392	16.2	16.1
2010	18,562	18,513	37,075	15.9	16.0
2015	19,375	19,333	38,708	15.4	17.4
2020	20,116	20,095	40,211	14.8	19.5
2025	20,758	20,781	41,539	14.3	21.7
2030	21,297	21,381	42,678	14.0	23.2
2035	21,749	21,895	43,644	13.8	24.5
2040	22,127	22,332	44,459	13.7	25.9
2045	22,449	22,699	45,148	13.6	27.5
2050	22,703	22,999	45,702		29.0
		HIGH FERTILITY—HIGH IMMIGRATION			
1921	4,530	4,258	8,788	29.3	9.3
1931	5,375	5,002	10,377	23.2	10.5
1941	5,901	5,606	11,507	22.4	12.0
1951	7,089	6,921	14,010	27.2	14.3
1961	9,219	9,019	18,238	26.1	15.1
1965	10,102	9,938	20,040	26.5	14.9
1970	11,354	11,221	22,575	27.3	14.5
1975	12,830	12,713	25,543	28.1	14.5
1980	14,543	14,424	28,967	28.3	15.0
1985	16,481	16,341	32,822	28.2	15.5
1990	18,734	18,460	37,194	27.9	15.9
1995	21,056	20,830	41,886	28.1	15.9
2000	23,797	23,489	47,286	28.3	15.1
2005	26,912	26,504	53,416	28.4	13.9
2010	30,424	29,901	60,325	28.4	13.3
2015	34,360	33,715	68,075	28.4	13.7
2020	38,766	37,991	76,757	28.3	14.1
2025	43,689	42,789	86,478	28.3	14.2
2030	49,203	48,168	97,371	28.4	14.0
2035	55,373	54,187	109,560	28.4	13.9
2040	62,276	60,923	123,199	28.4	13.9
2045	70,002	68,460	138,462	28.3	14.0
2050	78,645	76,899	155,544		14.1

SCHEDULE 12

PROJECTED LOW FERTILITY—LOW IMMIGRATION POPULATIONS FOR ALL OF CANADA BY AGE GROUP
(in thousands)

Middle of Year		14 and under		15-19		20-24		25-44		45-64		65-69		70 and over	
		Number	Prop'n of Total	Number	Prop'n of Total	Number	Prop'n of Total	Number	Prop'n of Total	Number	Prop'n of Total	Number	Prop'n of Total	Number	Prop'n of Total
			%		%		%		%		%		%		%
1961	Males	3,166	34.3	729	7.9	587	6.4	2,449	26.6	1,613	17.5	240	2.6	435	4.7
	Females	3,026	33.6	703	7.8	597	6.6	2,422	26.9	1,555	17.2	247	2.7	469	5.2
	Total	6,192	34.0	1,432	7.9	1,184	6.5	4,871	26.7	3,168	17.4	487	2.7	904	5.0
1970	Males	3,538	32.7	1,053	9.7	919	8.5	2,590	23.9	1,973	18.2	279	2.6	471	4.4
	Females	3,374	31.5	1,007	9.4	887	8.3	2,560	23.9	2,001	18.7	295	2.8	577	5.4
	Total	6,912	32.1	2,060	9.6	1,806	8.4	5,150	23.9	3,974	18.5	574	2.7	1,048	4.9
1980	Males	4,013	31.1	1,174	9.1	1,152	8.9	3,338	25.9	2,267	17.6	374	2.9	572	4.4
	Females	3,818	29.8	1,121	8.7	1,109	8.6	3,276	25.5	2,335	18.2	418	3.3	746	5.8
	Total	7,831	30.5	2,295	8.9	2,261	8.8	6,614	25.7	4,602	17.9	792	3.1	1,318	5.1
1990	Males	4,418	29.4	1,346	9.0	1,248	8.3	4,383	29.2	2,423	16.1	458	3.0	742	4.9
	Females	4,197	28.0	1,285	8.6	1,194	8.0	4,239	28.3	2,491	16.6	543	3.6	1,023	6.8
	Total	8,615	28.7	2,631	8.8	2,442	8.1	8,622	28.7	4,914	16.4	1,001	3.3	1,765	5.9
2000	Males	4,367	25.9	1,498	8.9	1,459	8.6	5,009	29.7	3,145	18.6	477	2.8	920	5.5
	Females	4,147	24.6	1,425	8.5	1,392	8.3	4,825	28.7	3,193	19.0	537	3.2	1,318	7.8
	Total	8,514	25.3	2,923	8.7	2,851	8.5	9,834	29.2	6,338	18.8	1,014	3.0	2,238	6.6
2010	Males	4,336	23.4	1,468	7.9	1,507	8.1	5,638	30.4	4,100	22.1	549	3.0	964	5.2
	Females	4,118	22.2	1,397	7.5	1,437	7.8	5,413	29.2	4,111	22.2	624	3.4	1,413	7.6
	Total	8,454	22.8	2,865	7.7	2,944	7.9	11,051	29.8	8,211	22.1	1,173	3.2	2,377	6.4
2020	Males	4,525	22.5	1,438	7.1	1,437	7.1	6,012	29.9	4,668	23.2	818	4.1	1,218	6.1
	Females	4,297	21.4	1,368	6.8	1,370	6.8	5,762	28.7	4,666	23.2	914	4.5	1,718	8.5
	Total	8,822	21.9	2,806	7.0	2,807	7.0	11,774	29.3	9,334	23.2	1,732	4.3	2,936	7.3
2030	Males	4,540	21.3	1,525	7.2	1,507	7.1	5,930	27.8	5,250	24.7	911	4.3	1,634	7.7
	Females	4,311	20.2	1,451	6.8	1,436	6.7	5,683	26.6	5,227	24.4	1,011	4.7	2,262	10.6
	Total	8,851	20.7	2,976	7.0	2,943	6.9	11,613	27.2	10,477	24.5	1,922	4.5	3,896	9.1
2040	Males	4,589	20.7	1,518	6.9	1,537	6.9	5,988	27.1	5,578	25.2	1,038	4.7	1,879	8.5
	Females	4,358	19.5	1,444	6.5	1,465	6.6	5,738	25.7	5,552	24.9	1,153	5.2	2,622	11.7
	Total	8,947	20.1	2,962	6.7	3,002	6.8	11,726	26.4	11,130	25.0	2,191	4.9	4,501	10.1
2050	Males	4,683	20.6	1,536	6.8	1,530	6.7	6,164	27.2	5,498	24.2	1,150	5.1	2,142	9.4
	Females	4,447	19.3	1,461	6.4	1,458	6.3	5,907	25.7	5,474	23.8	1,272	5.5	2,980	13.0
	Total	9,130	20.0	2,997	6.6	2,988	6.5	12,071	26.4	10,972	24.0	2,422	5.3	5,122	11.2

SCHEDULE 13

PROJECTED HIGH FERTILITY—HIGH IMMIGRATION POPULATIONS FOR ALL OF CANADA BY AGE GROUP

(in thousands)

Middle of Year		14 and under		15-19		20-24		25-44		45-64		65-69		70 and over	
		Number	Prop'n of Total	Number	Prop'n of Total	Number	Prop'n of Total	Number	Prop'n of Total	Number	Prop'n of Total	Number	Prop'n of Total	Number	Prop'n of Total
			%		%		%		%		%		%		%
1961	Males	3,166	34.3	729	7.9	587	6.4	2,449	26.6	1,613	17.5	240	2.6	435	4.7
	Females	3,026	33.6	703	7.8	597	6.6	2,422	26.9	1,555	17.2	247	2.7	469	5.2
	Total	6,192	34.0	1,432	7.9	1,184	6.5	4,871	26.7	3,168	17.4	487	2.7	904	5.0
1970	Males	3,850	33.9	1,072	9.4	948	8.3	2,727	24.0	2,002	17.6	281	2.5	474	4.2
	Females	3,669	32.7	1,025	9.1	917	8.2	2,692	24.0	2,035	18.1	300	2.7	583	5.2
	Total	7,519	33.3	2,097	9.3	1,865	8.3	5,419	24.0	4,037	17.9	581	2.6	1,057	4.7
1980	Males	5,103	35.1	1,286	8.8	1,203	8.3	3,622	24.9	2,367	16.3	381	2.6	581	4.0
	Females	4,854	33.7	1,227	8.5	1,160	8.0	3,555	24.6	2,436	16.9	429	3.0	763	5.3
	Total	9,957	34.4	2,513	8.7	2,363	8.2	7,177	24.8	4,803	16.6	810	2.8	1,344	4.6
1990	Males	6,683	35.7	1,720	9.2	1,499	8.0	4,840	25.8	2,758	14.7	475	2.5	759	4.1
	Females	6,347	34.4	1,640	8.9	1,435	7.8	4,686	25.4	2,728	14.8	566	3.1	1,058	5.7
	Total	13,030	35.0	3,360	9.0	2,934	7.9	9,526	25.6	5,486	14.7	1,041	2.8	1,817	4.9
2000	Males	8,494	35.7	2,251	9.5	2,022	8.5	6,036	25.4	3,516	14.8	519	2.2	959	4.0
	Females	8,064	34.3	2,141	9.1	1,930	8.2	5,817	24.8	3,569	15.2	585	2.5	1,383	5.9
	Total	16,558	35.0	4,392	9.3	3,952	8.4	11,853	25.1	7,085	15.0	1,104	2.3	2,342	5.0
2010	Males	10,928	35.9	2,832	9.3	2,547	8.4	7,803	25.6	4,631	15.2	625	2.1	1,058	3.5
	Females	10,378	34.7	2,694	9.0	2,429	8.1	7,494	25.1	4,648	15.5	713	2.4	1,545	5.2
	Total	21,306	35.3	5,526	9.2	4,976	8.2	15,297	25.4	9,279	15.4	1,338	2.2	2,603	4.3
2020	Males	13,920	35.9	3,650	9.4	3,239	8.4	9,938	25.6	5,738	14.8	911	2.3	1,370	3.5
	Females	13,218	34.8	3,473	9.1	3,088	8.1	9,524	25.1	5,728	15.1	1,023	2.7	1,937	5.1
	Total	27,138	35.4	7,123	9.3	6,327	8.2	19,462	25.4	11,466	14.9	1,934	2.5	3,307	4.3
2030	Males	17,628	35.8	4,635	9.4	4,149	8.4	12,519	25.4	7,371	15.0	1,072	2.2	1,829	3.7
	Females	16,741	34.8	4,410	9.2	3,956	8.2	11,993	24.9	7,328	15.2	1,195	2.5	2,545	5.3
	Total	34,369	35.3	9,045	9.3	8,105	8.3	24,512	25.2	14,699	15.1	2,267	2.3	4,374	4.5
2040	Males	22,351	35.9	5,854	9.4	5,227	8.4	15,878	25.5	9,327	15.0	1,391	2.2	2,248	3.6
	Females	21,228	34.8	5,570	9.1	4,983	8.2	15,208	25.0	9,260	15.2	1,548	2.5	3,126	5.1
	Total	43,579	35.4	11,424	9.3	10,210	8.3	31,086	25.2	18,587	15.1	2,939	2.4	5,374	4.4
2050	Males	28,221	35.9	7,421	9.4	6,614	8.4	20,013	25.4	11,708	14.9	1,781	2.3	2,887	3.7
	Females	26,803	34.9	7,062	9.2	6,304	8.2	19,167	24.9	11,616	15.1	1,973	2.6	3,974	5.2
	Total	55,024	35.4	14,483	9.3	12,918	8.3	39,180	25.2	23,324	15.0	3,754	2.4	6,861	4.4

SCHEDULE 14

PROJECTED LOW FERTILITY—LOW IMMIGRATION POPULATIONS FOR ALL OF CANADA BY AGE GROUP
(in thousands)

Middle of Year		18–19	20–24	25–34	35–44	45–54	55–59	60–64	65–69	70–74	75–79	80 and over
1965	Males	337	697	1,222	1,266	1,033	408	321	249	193	141	117
	Females	324	682	1,211	1,267	1,020	395	318	264	214	160	143
	Total	661	1,379	2,433	2,533	2,053	803	639	513	407	301	260
1966	Males	356	739	1,225	1,275	1,052	420	331	253	194	141	120
	Females	342	719	1,219	1,269	1,048	410	328	269	217	163	149
	Total	698	1,458	2,444	2,544	2,100	830	659	522	411	304	269
1967	Males	374	783	1,234	1,280	1,073	432	341	259	195	141	122
	Females	359	760	1,232	1,268	1,077	424	339	274	220	165	155
	Total	733	1,543	2,466	2,548	2,150	856	680	533	415	306	277
1968	Males	389	829	1,252	1,283	1,093	443	351	265	197	141	124
	Females	373	803	1,251	1,264	1,104	439	351	280	224	167	162
	Total	762	1,632	2,503	2,547	2,197	882	702	545	421	308	286
1969	Males	400	875	1,277	1,282	1,114	455	362	272	199	140	127
	Females	384	846	1,276	1,258	1,131	454	364	287	228	169	168
	Total	784	1,721	2,553	2,540	2,245	909	726	559	427	309	295
1970	Males	409	919	1,311	1,279	1,135	465	373	279	202	140	129
	Females	392	887	1,309	1,251	1,157	467	377	295	232	171	174
	Total	801	1,806	2,620	2,530	2,292	932	750	574	434	311	303
1971	Males	418	960	1,356	1,273	1,155	475	384	287	205	140	131
	Females	401	926	1,350	1,244	1,181	481	391	304	237	173	180
	Total	819	1,886	2,706	2,517	2,336	956	775	591	442	313	311
1972	Males	427	996	1,411	1,267	1,174	483	395	296	210	141	132
	Females	409	960	1,401	1,237	1,202	493	405	314	242	175	186
	Total	836	1,956	2,812	2,504	2,376	976	800	610	452	316	318
1973	Males	434	1,025	1,479	1,258	1,192	491	406	305	215	142	133
	Females	415	988	1,460	1,232	1,220	504	419	325	248	178	191
	Total	849	2,013	2,939	2,490	2,412	995	825	630	463	320	324
1974	Males	439	1,047	1,558	1,247	1,210	496	417	315	220	144	134
	Females	421	1,008	1,530	1,230	1,236	513	434	337	254	182	196
	Total	860	2,055	3,088	2,477	2,446	1,009	851	652	474	326	330

SCHEDULE 15

CENSUS AND PROJECTED POPULATIONS FOR QUEBEC
(in thousands)

Middle of Year	Males	Females	Total	Birth rate per 1,000	Proportion of population aged 65 and over to population aged 20 to 64
		LOW FERTILITY—LOW IMMIGRATION			%
1921	1,180	1,181	2,361	37.6	9.8
1931	1,447	1,428	2,875	29.1	9.8
1941	1,673	1,659	3,332	26.8	10.1
1951	2,022	2,034	4,056	29.8	10.9
1961	2,632	2,627	5,259	26.1	11.7
1965	2,859	2,862	5,721	25.4	11.9
1970	3,156	3,162	6,318	24.5	12.2
1975	3,472	3,481	6,953	23.7	12.8
1980	3,808	3,819	7,627	22.6	13.6
1985	4,141	4,156	8,297	21.1	14.5
1990	4,464	4,475	8,939	19.3	15.5
1995	4,765	4,775	9,540	17.6	16.2
2000	5,038	5,047	10,085	16.5	16.1
2005	5,290	5,299	10,589	16.1	15.7
2010	5,547	5,549	11,096	15.8	16.3
2015	5,788	5,789	11,577	15.3	18.0
2020	6,009	6,011	12,020	14.8	20.0
2025	6,195	6,212	12,407	14.2	22.1
2030	6,349	6,378	12,727	13.9	23.6
2035	6,475	6,522	12,997	13.8	24.8
2040	6,584	6,643	13,227	13.7	26.2
2045	6,673	6,749	13,422	13.6	27.7
2050	6,751	6,833	13,584		29.1
		HIGH FERTILITY—HIGH IMMIGRATION			
1921	1,180	1,181	2,361	37.6	9.8
1931	1,447	1,428	2,875	29.1	9.8
1941	1,673	1,659	3,332	26.8	10.1
1951	2,022	2,034	4,056	29.8	10.9
1961	2,632	2,627	5,259	26.1	11.7
1965	2,918	2,916	5,834	27.6	11.7
1970	3,310	3,312	6,622	28.1	11.9
1975	3,770	3,773	7,543	28.5	12.4
1980	4,294	4,289	8,583	28.4	13.2
1985	4,875	4,864	9,739	28.0	13.8
1990	5,520	5,494	11,014	27.7	14.4
1995	6,238	6,192	12,430	27.7	14.7
2000	7,040	6,973	14,013	27.8	14.3
2005	7,947	7,845	15,792	27.8	13.6
2010	8,958	8,826	17,784	27.8	13.6
2015	10,087	9,913	20,000	27.7	14.1
2020	11,336	11,123	22,459	27.6	14.5
2025	12,719	12,470	25,189	27.6	14.6
2030	14,265	13,968	28,233	27.6	14.4
2035	15,982	15,641	31,623	27.6	14.3
2040	17,894	17,506	35,400	27.6	14.3
2045	20,026	19,580	39,606	27.6	14.4
2050	22,397	21,893	44,290		14.5

SCHEDULE 16

PROJECTED LOW FERTILITY—LOW IMMIGRATION POPULATIONS FOR QUEBEC BY AGE GROUP

(in thousands)

Middle of Year		14 and under		15–19		20–24		25–44		45–64		65–69		70 and over	
		Number	Prop'n of Total	Number	Prop'n of Total	Number	Prop'n of Total	Number	Prop'n of Total	Number	Prop'n of Total	Number	Prop'n of Total	Number	Prop'n of Total
			%		%		%		%		%		%		%
1961	Males	952	36.2	236	9.0	181	6.9	695	26.4	423	16.1	57	2.2	88	3.3
	Females	912	34.7	232	8.8	189	7.2	707	26.9	428	16.3	60	2.3	102	3.9
	Total	1,864	35.4	468	8.9	370	7.0	1,402	26.6	851	16.2	117	2.2	190	3.6
1970	Males	1,064	33.7	316	10.0	283	9.0	782	24.8	534	16.9	71	2.2	106	3.4
	Females	1,018	32.2	303	9.6	275	8.7	795	25.1	556	17.6	80	2.5	135	4.3
	Total	2,082	33.0	619	9.8	558	8.8	1,577	25.0	1,090	17.3	151	2.4	241	3.8
1980	Males	1,203	31.6	353	9.3	344	9.0	1,026	26.9	639	16.8	99	2.6	144	3.8
	Females	1,147	30.0	337	8.8	333	8.7	1,018	26.7	675	17.7	114	3.0	195	5.1
	Total	2,350	30.8	690	9.0	677	8.9	2,044	26.8	1,314	17.2	213	2.8	339	4.4
1990	Males	1,314	29.4	403	9.0	377	8.4	1,319	29.5	729	16.3	127	2.8	195	4.4
	Females	1,250	27.9	386	8.6	361	8.1	1,280	28.6	770	17.2	151	3.4	277	6.2
	Total	2,564	28.7	789	8.8	738	8.3	2,599	29.1	1,499	16.8	278	3.1	472	5.3
2000	Males	1,300	25.8	445	8.8	434	8.6	1,501	29.8	964	19.1	139	2.8	255	5.1
	Females	1,232	24.4	424	8.4	415	8.2	1,451	28.7	990	19.6	162	3.2	373	7.4
	Total	2,532	25.1	869	8.6	849	8.4	2,952	29.3	1,954	19.4	301	3.0	628	6.2
2010	Males	1,288	23.2	437	7.9	448	8.1	1,683	30.3	1,233	22.2	175	3.2	283	5.1
	Females	1,221	22.0	415	7.5	427	7.7	1,618	29.2	1,240	22.3	204	3.7	424	7.6
	Total	2,509	22.6	852	7.7	875	7.9	3,301	29.7	2,473	22.3	379	3.4	707	6.4
2020	Males	1,348	22.4	427	7.1	427	7.1	1,787	29.7	1,399	23.3	245	4.1	376	6.3
	Females	1,277	21.2	405	6.7	406	6.8	1,712	28.5	1,401	23.3	274	4.6	536	8.9
	Total	2,625	21.8	832	6.9	833	6.9	3,499	29.1	2,800	23.3	519	4.3	912	7.6
2030	Males	1,354	21.3	454	7.2	447	7.0	1,761	27.7	1,567	24.7	273	4.3	493	7.8
	Females	1,283	20.1	431	6.8	426	6.7	1,685	26.4	1,561	24.5	304	4.8	688	10.8
	Total	2,637	20.7	885	7.0	873	6.9	3,446	27.1	3,128	24.6	577	4.5	1,181	9.3
2040	Males	1,362	20.7	453	6.9	459	7.0	1,778	27.0	1,657	25.2	311	4.7	564	8.6
	Females	1,292	19.4	430	6.5	436	6.6	1,700	25.6	1,650	24.8	345	5.2	790	11.9
	Total	2,654	20.1	883	6.7	895	6.8	3,478	26.3	3,307	25.0	656	5.0	1,354	10.2
2050	Males	1,393	20.6	456	6.8	455	6.7	1,834	27.2	1,632	24.2	341	5.1	640	9.5
	Females	1,321	19.3	433	6.3	433	6.3	1,754	25.7	1,622	23.7	378	5.5	892	13.1
	Total	2,714	20.0	889	6.5	888	6.5	3,588	26.4	3,254	24.0	719	5.3	1,532	11.3

SCHEDULE 17

PROJECTED HIGH FERTILITY—HIGH IMMIGRATION POPULATIONS FOR QUEBEC BY AGE GROUP
(in thousands)

Middle of Year		14 and under		15-19		20-24		25-44		45-64		65-69		70 and over	
		Number	Prop'n of Total	Number	Prop'n of Total	Number	Prop'n of Total	Number	Prop'n of Total	Number	Prop'n of Total	Number	Prop'n of Total	Number	Prop'n of Total
			%		%		%		%		%		%		%
1961	Males	952	36.2	236	9.0	181	6.9	695	26.4	423	16.1	57	2.2	88	3.3
	Females	912	34.7	232	8.8	189	7.2	707	26.9	428	16.3	60	2.3	102	3.9
	Total	1,864	35.4	468	8.9	370	7.0	1,402	26.6	851	16.2	117	2.2	190	3.6
1970	Males	1,156	34.9	322	9.7	291	8.8	820	24.8	542	16.4	72	2.2	107	3.2
	Females	1,106	33.4	308	9.3	283	8.5	833	25.2	565	17.1	81	2.4	136	4.1
	Total	2,262	34.2	630	9.5	574	8.7	1,653	25.0	1,107	16.7	153	2.3	243	3.7
1980	Males	1,524	35.5	386	9.0	359	8.4	1,108	25.8	668	15.6	101	2.4	148	3.4
	Females	1,453	33.9	369	8.6	348	8.1	1,098	25.6	704	16.4	117	2.7	200	4.7
	Total	2,977	34.7	755	8.8	707	8.2	2,206	25.7	1,372	16.0	218	2.5	348	4.1
1990	Males	1,973	35.7	514	9.3	451	8.2	1,452	26.3	798	14.5	132	2.4	200	3.6
	Females	1,876	34.1	491	8.9	433	7.9	1,410	25.7	839	15.3	158	2.9	287	5.2
	Total	3,849	34.9	1,005	9.1	884	8.0	2,862	26.0	1,637	14.9	290	2.6	487	4.4
2000	Males	2,487	35.3	664	9.4	599	8.5	1,802	25.6	1,071	15.2	151	2.1	266	3.8
	Females	2,360	33.8	633	9.1	573	8.2	1,742	25.0	1,098	15.7	176	2.5	391	5.6
	Total	4,847	34.6	1,297	9.3	1,172	8.4	3,544	25.3	2,169	15.5	327	2.3	657	4.7
2010	Males	3,171	35.4	830	9.3	749	8.4	2,317	25.9	1,385	15.5	197	2.2	309	3.4
	Females	3,007	34.1	789	8.9	715	8.1	2,230	25.3	1,396	15.8	229	2.6	460	5.2
	Total	6,178	34.7	1,619	9.1	1,464	8.2	4,547	25.6	2,781	15.6	426	2.4	769	4.3
2020	Males	4,066	35.3	1,059	9.3	944	8.3	2,924	25.8	1,711	15.1	272	2.4	420	3.7
	Females	3,797	34.1	1,006	9.0	899	8.1	2,804	25.2	1,713	15.4	305	2.7	599	5.4
	Total	7,803	34.7	2,065	9.2	1,843	8.2	5,728	25.5	3,424	15.2	577	2.6	1,019	4.5
2030	Males	5,020	35.2	1,335	9.4	1,200	8.4	3,654	25.6	2,187	15.3	320	2.2	549	3.8
	Females	4,757	34.1	1,268	9.1	1,142	8.2	3,498	25.0	2,178	15.6	357	2.6	768	5.5
	Total	9,777	34.6	2,603	9.2	2,342	8.3	7,152	25.3	4,365	15.5	677	2.4	1,317	4.7
2040	Males	6,304	35.2	1,668	9.3	1,497	8.4	4,597	25.7	2,742	15.3	414	2.3	672	3.8
	Females	5,976	34.1	1,584	9.0	1,425	8.1	4,397	25.1	2,725	15.6	462	2.6	937	5.4
	Total	12,280	34.7	3,252	9.2	2,922	8.3	8,994	25.4	5,467	15.4	876	2.5	1,609	4.5
2050	Males	7,887	35.2	2,094	9.3	1,875	8.4	5,742	25.6	3,416	15.3	525	2.3	858	3.8
	Females	7,477	34.2	1,989	9.1	1,784	8.1	5,490	25.1	3,387	15.5	582	2.7	1,184	5.4
	Total	15,364	34.7	4,083	9.2	3,659	8.3	11,232	25.4	6,803	15.4	1,107	2.5	2,042	4.6

SCHEDULE 18

PROJECTED LOW FERTILITY—LOW IMMIGRATION POPULATIONS FOR QUEBEC BY AGE GROUP

(in thousands)

Middle of Year		18–19	20–24	25–34	35–44	45–54	55–59	60–64	65–69	70–74	75–79	80 and over
1965	Males	106	225	364	358	278	108	83	61	44	29	23
	Females	103	225	373	366	282	111	87	68	51	35	29
	Total	209	450	737	724	560	219	170	129	95	64	52
1966	Males	111	237	370	362	284	112	86	63	45	30	23
	Females	107	235	379	369	290	114	91	70	52	36	30
	Total	218	472	749	731	574	226	177	133	97	66	53
1967	Males	115	249	376	365	290	115	89	65	46	30	24
	Females	111	245	386	371	298	118	94	72	54	37	31
	Total	226	494	762	736	588	233	183	137	100	67	55
1968	Males	118	261	385	367	297	118	92	67	47	31	24
	Females	114	256	396	374	306	121	98	75	55	38	33
	Total	232	517	781	741	603	239	190	142	102	69	57
1969	Males	121	272	398	369	305	121	95	69	48	31	25
	Females	116	265	407	374	314	125	101	77	57	39	34
	Total	237	537	805	743	619	246	196	146	105	70	59
1970	Males	123	283	412	370	311	124	99	71	49	32	25
	Females	119	275	420	375	323	128	105	80	59	40	36
	Total	242	558	832	745	634	252	204	151	108	72	61
1971	Males	126	293	428	371	318	126	102	74	50	32	26
	Females	121	284	434	375	331	132	109	83	61	41	38
	Total	247	577	862	746	649	258	211	157	111	73	64
1972	Males	127	302	446	370	326	129	105	76	52	33	27
	Females	123	291	451	375	339	135	112	86	63	42	40
	Total	250	593	897	745	665	264	217	162	115	75	67
1973	Males	129	309	467	370	333	131	108	79	54	34	27
	Females	124	298	469	376	346	138	116	90	65	43	41
	Total	253	607	936	746	679	269	224	169	119	77	68
1974	Males	131	314	492	370	339	133	111	82	55	35	28
	Females	125	303	489	377	353	141	119	93	68	45	42
	Total	256	617	981	747	692	274	230	175	123	80	70

APPENDIX 2

Concerning the Participating Population

1. *General*

The rates of participation needed for the estimates were factors that, when applied to total population groups for any future year, would produce average numbers of workers who will contribute under the Plan in that year. Most of the statistics underlying such rates were drawn from "The Labour Force" monthly bulletins prepared by the Special Surveys Division of D.B.S. (hereinafter termed "Special Survey statistics") and from the "Labour Force" statistical reports based on the 1961 Census (hereinafter termed "1961 Census data"). The manner in which the rates were developed is described in section 2 below.

In the development of the participation rates, consideration had to be given to rates of unemployment and to proportions of paid workers who either will not be eligible to contribute because of earnings less than the minimums required for contribution purposes or will not contribute for less definitive reasons. The assumptions relating to these factors are described and discussed in section 3 below.

Initial estimates of contributory earnings were made without separation into the earnings categories designated as "salary and wages" and "self-employed earnings". The manner in which earnings attributable to these two categories were determined from total contributory earnings is described in section 4 below.

It is probable that relatively low participation will be experienced among certain groups of self-employed or "own account" workers. The manner in which the short-range estimates were adjusted to take account of expected lower-than-average participation among self-employed farmers is described in section 5 below.

2. *Development of participation rates*

The crude participation rates shown in Schedule 1 below were produced directly from Special Survey statistics which pertain to a "labour force" and a "base population" that exclude inmates of institutions, members of the armed services, Indians living on reserves and residents of the Yukon and Northwest Territories and include unpaid family workers. This schedule is included simply to provide an indication of the general level and the trend of work participation, particularly with respect to females, over the last decade.

In the development of participation rates that would provide a basis for rates required for purposes of the financial estimates, 1961 Census data and Special Survey statistics for the period 1959 to 1963 were used interdependently to determine, for Canada excluding Quebec, "covered worker" populations for 1961 by sex and age group. The "covered

SCHEDULE 1

PARTICIPATION RATES FOR ALL OF CANADA
BASED ON SPECIAL SURVEY STATISTICS

Year	Age Group						
	14–19	20-24	25–34	35–44	45–54	55–64	65 and over
MALES	%	%	%	%	%	%	%
1954	50.2	92.0	97.3	97.3	95.6	85.4	33.2
1956	48.1	91.7	97.6	97.6	96.0	86.4	34.1
1958	45.6	91.6	97.9	97.7	96.1	87.1	32.2
1960	43.0	91.2	97.9	97.7	96.4	86.8	30.2
1962	39.6	89.0	97.6	97.8	95.6	86.1	28.4
1963	39.0	88.9	97.6	97.8	96.0	86.0	26.3
FEMALES							
1954	33.6	46.6	24.4	22.1	21.1	14.0	3.7
1956	33.9	47.1	25.1	23.8	24.4	15.9	4.5
1958	32.1	47.4	26.2	26.2	27.5	19.0	5.2
1960	32.6	48.1	27.3	29.4	30.4	21.2	5.5
1962	31.0	49.7	28.3	31.0	33.3	23.8	5.5
1963	29.9	50.0	29.2	31.7	34.7	24.7	5.8

worker" populations so determined included all paid workers (both wage-earners and self-employed workers) except members of the armed services, numbers of workers determined in accordance with assumed short-range and long-range rates of unemployment and numbers of workers determined in accordance with assumed proportions of workers who will not contribute because of earnings less than the minimums required for contribution purposes or for other reasons. These "covered worker" populations were then divided by corresponding total populations taken from 1961 Census data to obtain the basic participation rates shown in Schedule 2 below.

SCHEDULE 2

BASIC PARTICIPATION RATES FOR
CANADA EXCLUDING QUEBEC

Age Group	Short-Range Unemployment Assumptions		Long-Range Unemployment Assumptions	
	Males	Females	Males	Females
	%	%	%	%
20-24	69.3	41.5	70.7	41.9
25-34	84.0	25.8	84.9	26.0
35-44	86.4	27.5	87.2	27.7
45-54	86.1	29.5	86.9	29.7
55-59	80.8	23.9	81.7	24.1
60-64	72.4	18.4	73.2	18.4

For males, for purposes of both the short-range and long-range estimates, and for females, for purposes of the short-range estimates and the long-range "high cost" estimates, it was decided to use participation rates for ages 20 to 64 that follow almost exactly the basic rates

shown in Schedule 2 above. However, for purposes of the long-range "low cost" estimates, female participation rates were chosen to take account of a probable continuation of the trend to higher participation among females that is illustrated in Schedule 1 above.

Because customary Special Survey statistics do not apply directly to the age groups 18-19 and 65-69, the choice of participation rates for these age groups required special consideration.

For workers under age 20, the "Special Survey" participation rates have decreased over the years, particularly for males. Also, as might be expected, the seasonal variation is considerable. For example, for the age group 17-19, the rates for males and females for January, 1962, were 57 per cent and 50 per cent, respectively, and for July, 1962, were 80 per cent and 60 per cent, respectively. Yet again, a relatively high proportion of workers under age 20 fall into the categories of unpaid family workers and workers with annual earnings less than the minimums allowable for contribution purposes. While it is clearly difficult to predict what participation rates will apply in the future, the extent of participation at these young ages will not have any significant effect on either current contributions or eventual benefits. For the age group 18-19, therefore, it was decided to use the relatively low participation rate of 40 per cent for both males and females for purposes of both the short-range and the long-range estimates.

For the age group 65-69, a special study indicated that, after taking account of workers who will not contribute under the Plan because of annual earnings less than the minimums required for contribution purposes and for other reasons, current participation rates were of the order of 43 per cent for males and 9 per cent for females. These rates were assumed applicable for both the short-range and the long-range estimates.

The participation rates that were used in the development of the current estimates are shown in Schedule 3 below.

SCHEDULE 3

PARTICIPATION RATES FOR CANADA EXCLUDING QUEBEC USED FOR THE CURRENT ESTIMATES

Class of Estimates	Age Group							
	18–19	20–24	25–34	35–44	45–54	55–59	60–64	65–69
MALES	%	%	%	%	%	%	%	%
Short-range	40	69	84	86	86	81	72	43
Long-range ("high cost" and "low cost")	40	71	85	87	87	82	73	43
FEMALES								
Short-range and "high cost" long-range	40	42	26	28	30	24	18	9
"Low cost" long-range:								
1966-74	40	42	26	28	30	24	18	9
1975-84	40	42	31	33	35	29	21	9
1985 & after ..	40	42	36	38	40	34	24	9

For calculation purposes, participation rates were required for each age of the age group 65-69. The breakdown by individual age was based on the pattern of participation by age within this age group that was experienced in the United States during a recent period. The breakdown is shown in Schedule 4 below.

SCHEDULE 4

PARTICIPATION RATES FOR INDIVIDUAL AGES WITHIN THE AGE GROUP 65-69

Age	Males	Females
	%	%
65	49	13
66	46	11
67	43	9
68	40	8
69	37	7

3. *Assumptions as respects unemployed workers and non-contributors*

(a) *Rates of unemployment*

In Schedule 5 below is shown the average rate of unemployment for Canada excluding Quebec, expressed as a percentage of the labour force, for each calendar year 1954 to 1963.

SCHEDULE 5

AGGREGATE RATES OF UNEMPLOYMENT FOR CANADA EXCLUDING QUEBEC

Calendar Year	Proportion of Labour Force Unemployed
	%
1954	4.0
1955	3.7
1956	2.8
1957	4.1
1958	6.4
1959	5.2
1960	6.2
1961	6.4
1962	5.3
1963	4.8

For the short term, despite a decreasing trend in the rate of unemployment from 1961 to the present date, it would seem to be too early to assume that there will be a continuing significant decrease in the aggregate rate of unemployment from the general level that has prevailed over the last several years. In any event, in the early years of operation of the Plan, the rate of unemployment has a greater effect on

contributions than on benefits. For the long term also, the rate of unemployment has a greater effect on contributions than on benefits because of the operation of the "drop-out" provisions of the Plan. Thus, if the rates of unemployment assumed for purposes of the estimates turn out to be too high, the estimated percentage costs are also too high.

For purposes of the current estimates, the aggregate rates of unemployment assumed to be applicable for Canada excluding Quebec were, roughly, 5 per cent annually for the period 1966 to 1975 and 4 per cent annually for the period 1976 and after.

Based on a study of the experience over recent years as respects the relationships between

(i) rates of unemployment for both sexes and corresponding rates for males and females separately, and

(ii) rates of unemployment classified by sex for all ages and corresponding rates for relevant age groups,

rates of unemployment by sex and age group were determined for use in the development of rates of participation in the Plan. These rates are shown in Schedule 6 below.

SCHEDULE 6

RATES OF UNEMPLOYMENT USED IN THE DEVELOPMENT OF PARTICIPATION RATES FOR CANADA EXCLUDING QUEBEC

Age Group	Rates for 1966-75		Rates for 1976 and after	
	Males	Females	Males	Females
	%	%	%	%
All Ages	5.6	3.2	4.5	2.5
15-19	11.9	8.1	9.5	6.3
20-24	8.5	3.7	6.8	2.9
25-34	5.4	2.5	4.3	2.0
35-44	4.4	2.3	3.5	1.8
45-54	4.6	2.1	3.7	1.6
55-64	5.3	2.4	4.3	1.9
65 & over	4.2	2.9	3.4	2.3

(b) *Proportions of workers who will not contribute because of annual earnings less than the minimums allowable for contribution purposes and for other reasons*

When the Plan comes into operation on January 1, 1966, a worker with annual salary and wages of less than $600 may not contribute under the Plan unless such worker has enough self-employed earnings in that year to make his total annual earnings equal to $800 or more. Both of these minimums will be subject to adjustments in future years in accordance with changes in the Pension Index until 1975 and in the Earnings Index thereafter.

From special tabulations of 1961 Census data for all of Canada and for Quebec separately that showed numbers of wage-earners and total annual earnings classified by sex, age group and earnings range, were computed proportions of wage-earners in Canada excluding Quebec

reporting annual earnings of less than $500 for the twelve-month period ended June, 1961. Because of increases in average earnings over recent years at an average annual rate of something over 3 per cent, it was considered that these proportions could be taken as broadly applicable to wage-earners with annual earnings of less than $600 during the first two years of operation of the Plan. The computed proportions are shown in Schedule 7 below.

SCHEDULE 7

PROPORTIONS OF WAGE-EARNERS IN CANADA EXCLUDING QUEBEC REPORTING ANNUAL EARNINGS OF LESS THAN $500
(1961 Census data)

Age Group	Males	Females
	%	%
18 & over	3.56	11.99
18-19	21.55	23.14
20-24	6.21	10.31
25-34	2.10	11.31
35-44	1.64	11.46
45-54	2.00	10.04
55-59	2.63	9.76
60-64	3.42	11.67
65-69	6.49	15.06
70 & over	11.09	23.27

It is almost certain that a substantial proportion of the workers who entered into the statistics from which the percentages in Schedule 7 were computed had earnings of less than $500 during the twelve-month period ended June, 1961, either by reason of entering or leaving the labour force part way through that period or by reason of unemployment for some part of that period. Because the average labour force for any year is determined as the average of the labour force figures for the twelve months of that year, workers who enter or leave the labour force during the year are not included as full units in the annual labour force. Also, a number of unemployed workers are, in effect, excluded from the estimated "covered worker" population by a reduction of the basic participation rates in accordance with assumed rates of unemployment. Thus, thought had to be given to the avoidance of duplicate exclusions when account was taken of workers with average earnings less than the minimums required for contribution purposes.

Besides workers who will not be eligible to contribute under the Plan because of earnings less than the required minimums, there may well be substantial numbers of self-employed or "own account" workers with net earnings above the required minimums who will not contribute because of lack of records, lack of understanding of rights and responsibilities, fear of getting on tax rolls of any type, habitation in sparsely settled areas and so on. For instance, if experience under the Canada Pension Plan accords with early experience under the OASDI system in the United States, participation among self-employed farmers will

be relatively low, at least in the early years of operation of the Plan. Similar low participation is to be expected among other groups of workers such as fishermen, hunters, trappers and domestic servants with less than full-time employment.

With the almost complete lack of pertinent statistics, until experience develops under the Plan it will not be possible to predict with any confidence the proportions of otherwise eligible workers who either will not be eligible to contribute because of annual earnings less than the minimums required for contribution purposes or will not contribute for reasons of the nature mentioned in the preceding paragraph. For the current estimates, the reduction factors used to take account of such workers in the development of the participation rates for all the major age groups were 3 per cent for males and 10 per cent for females. (Additional account is taken of probable lower-than-average participation among self-employed farmers in the manner described in section 5 below.)

4. *Proportion of total contributory earnings attributable to salary and wages and to self-employed earnings*

For Canada excluding Quebec, the proportion of self-employed workers to total paid workers less members of the armed services was 19.9 per cent for males and 5.9 per cent for females according to 1961 Census data and 20.3 per cent for males and 4.7 per cent for females according to Special Survey statistics for 1963. While it is recognized that many workers classed as wage-earners have additional earnings from self-employment and many workers classed as self-employed workers have additional earnings from salaries and wages, no reliable statistics were available to estimate the extent or even the direction of the difference in the totals of these additional earnings.

For purposes of the current estimates, it was assumed that the proportion of estimated total contributory earnings attributable to salary and wages would be 80 per cent for males and 95 per cent for females, and that the remainder would be attributable to self-employed earnings.

5. *Adjustment of estimates to take account of expected "lower-than-average" participation experience among self-employed farmers*

(a) *General*

Under the Old-Age, Survivors and Disability Insurance system of the United States, coverage was extended to self-employed farmers in 1954. A report on the participation experience during the early years of this coverage was given in the May, 1962, issue of the Social Security Bulletin published by the U.S. Department of Health, Education, and Welfare. As respects extent of participation, the essence of this report was that the number of farmers reporting self-employed income for OASDI purposes was about 50 per cent of the total number of farms in the first full year of coverage and that such proportion increased gradually to about 60 per cent in the fourth year of coverage.

Although the conditions for participation of self-employed farmers under the U.S. programme over the period covered in the report mentioned in the preceding paragraph were somewhat different than those proposed for the Canada Pension Plan, it seemed reasonable to assume that early experience under the Canada Pension Plan will not be unlike

the corresponding experience under the U.S. programme. Consequently, since no special account was taken of probable "lower-than-average" participation of self-employed farmers in the development of the participation rates, it was considered that some adjustment should be made in contributory self-employed earnings and in benefits based thereon.

For the long-range estimates that show relationships between contribution income and benefit outgo in specific years, proportionate inflation of contribution income and benefit outgo has no effect on the validity of the results. Thus, when the Plan is in a fairly mature stage, any overestimation of participation among self-employed farmers would have little effect on the estimated percentages of contributory earnings required to provide benefits and expenses of administration. Also, for many past years the proportions of farmers in relation to the labour force and to all self-employed workers have been steadily decreasing and it is not unlikely that this trend will continue into the future. In such event, the significance of this group will decline from the standpoint of the financial estimates. Again, it is to be expected that the relative number of small farms will decrease in future years. If such a decrease should occur, the proportion of self-employed farmers participating in the Plan will likely show a corresponding increase so that there will be less need for adjustment. For the above reasons, it was considered that no adjustments were necessary for the long-range estimates.

For female workers, the group having mainly self-employed earnings is only about 5 per cent of the female labour force and self-employed females in agriculture constitute only about 10 per cent of all female self-employed workers. Thus, for the short term as well as the long term, it was considered that the proportion of female earnings arising from self-employment in agriculture would be so small that no adjustment in the estimates would be necessary.

It follows from the above remarks that special adjustments were considered to be necessary only for the short-term estimates in respect of contributions and benefits that depend on self-employed earnings of male workers.

(b) *Manner and extent of adjustments*

As noted in section 4 above, it was assumed that, for male workers, contributory salary and wages would be equal to 80 per cent of total contributory earnings determined without taking account of any overstatement arising from "lower-than-average" participation among self-employed farmers. Unadjusted contributory self-employed earnings would therefore be equal to 20 per cent of unadjusted total contributory earnings.

According to 1961 Census data for Canada excluding Quebec, the proportion of male self-employed farmers to total male self-employed workers was about 48 per cent. Thus, when some weight was given to the decreasing trend in the number of workers in agriculture, it seemed not unreasonable to assume that, for the period 1966-75, the average proportion of male self-employed farmers to total male self-employed workers would be 45 per cent.

In the development of the participation rates, about 3 per cent of otherwise eligible male workers including male self-employed farmers were assumed either to be ineligible to contribute under the Plan because

of annual earnings less than the minimums allowable for contribution purposes or would not participate for other reasons. To take account, for purposes of the short-range estimates, of additional male self-employed farmers who will not contribute under the Plan because of low income or for other reasons, it was assumed that a further 50 per cent of male self-employed farmers will not contribute in 1966 and that such proportion will gradually decrease to about 35 per cent in 1969 and will remain at that level to 1975.

On the basis of the assumptions described in the preceding paragraphs, total male contributory self-employed earnings for the short term were taken to be the proportions of total unadjusted male contributory earnings shown in Schedule 8 below.

SCHEDULE 8

MALE CONTRIBUTORY SELF-EMPLOYED EARNINGS AS PROPORTIONS OF TOTAL UNADJUSTED MALE CONTRIBUTORY EARNINGS

Year	Proportion
	%
1966	15.5
1967	16.0
1968	16.5
1969	17.0
1970	17.0
1971	17.0
1972	17.0
1973	17.0
1974	17.0
1975	17.0

Clearly, the benefits that depend on male contributory earnings, namely, male age retirement pensions, male disability pensions, widows' and orphans' pensions and male death benefits, will be affected by the reductions in male contributory earnings that were made to take account of "lower-than-average" participation among male self-employed farmers. While, for any year after 1967, the extent of reduction in benefits should be slightly greater than the reduction in male self-employed contributory earnings for that year because of the carry-over effect of proportionately higher reductions in 1966, 1967 and 1968 than in later years, it was considered satisfactory to assume the same year-by-year decrease factors for the affected benefits as for contributory earnings, that is, 4 per cent for 1967, 3.5 per cent for 1968 and 3 per cent for each year 1969 to 1975.

APPENDIX 3

Average Earnings

1. *General*

The estimates, particularly for the long term, are dependent to a significant degree on assumptions made as respects the rate of increase in average earnings that will apply over the period covered by the estimates. Past experience is examined and the assumptions used for the estimates are described in section 2 below.

The average earnings figures needed to accord with the calculation methods used for the estimates and, incidentally, with the rates of participation developed as described in Appendix 2, were average annual earnings "rates" for all workers eligible to contribute under the Canada Pension Plan excluding an average number of unemployed workers, determined in such manner that the earnings taken into account for a worker with earnings greater than the contributory earnings upper limit is an amount equal to that limit. Such average earnings rates, applicable to workers in Canada excluding Quebec, were required for males and females separately and for each relevant age group for each year covered by the estimates. Their development is described in section 3 below.

2. *Rates of increase in average earnings*

In Schedule 1 below are shown, for each twelve-month period from 1948 to 1963, the average Consumer Price Index for Canada and the average D.B.S. "average weekly wages and salaries" statistic for the Industrial Composite classification (for all of Canada) together with the rate of change in those statistics from year to year.

From the schedule below, it may be determined that, for periods of 15 years, 10 years and 5 years ended in 1963, the average annual rates of increase in the Consumer Price Index were 2.1 per cent, 1.4 per cent and 1.2 per cent, respectively, and the average annual rates of increase in average weekly wages and salaries were 5.0 per cent, 3.8 per cent and 3.4 per cent, respectively. Thus, over those periods, the differences in the average annual rates of increase in average weekly wages and salaries and the Consumer Price Index were 2.9 per cent, 2.4 per cent and 2.2 per cent, respectively.

For the short-range estimates and for the long-range "low cost" estimates, it was assumed that the Consumer Price Index would increase at an average annual rate of 1½ per cent from 1967 throughout the whole period covered by the estimates. For the long-range "high cost" estimates, the corresponding assumption was that the Consumer Price Index would increase at an average annual rate of 1½ per cent from 1967 to 1975 and 2 per cent thereafter. Thus, for example, if it should be considered that average annual increases in average earnings arising from increased productivity will range from 2 per cent to 2½ per cent in

SCHEDULE 1

HISTORIES OF CONSUMER PRICE INDEX AND AVERAGE WEEKLY WAGES AND SALARIES

Calendar Year	Consumer Price Index		Average Weekly Wages and Salaries	
	Index	Percentage increase from preceding year	Amount	Percentage increase from preceding year
		%	$	%
1948	97.0		40.06	
1949	100.0	3.1	42.96	7.2
1950	102.9	2.9	45.08	4.9
1951	113.7	10.5	50.04	11.0
1952	116.5	2.5	54.41	8.7
1953	115.5	—0.9	57.53	5.7
1954	116.2	0.6	59.04	2.6
1955	116.4	0.2	61.05	3.4
1956	118.1	1.5	64.44	5.6
1957	121.9	3.2	67.93	5.4
1958	125.1	2.6	70.43	3.7
1959	126.5	1.1	73.47	4.3
1960	128.0	1.2	75.83	3.2
1961	129.2	0.9	78.17	3.1
1962	130.7	1.2	80.59	3.1
1963	133.0	1.8	83.41	3.5

future years, it would be appropriate to assume, for purposes of the estimates, that total average annual increases in average earnings will be of the order of 4 per cent. (It should be emphasized here that the validity of estimated required contribution rates depends far less on the separate assumptions as respects increases in prices and increases in average earnings than on the relationship between the two.)

Because the average rate of increase in average earnings over the long-term future is not predictable within close limits, one complete set of short-range and long-range "high cost" and "low cost" estimates was developed on the assumption that the average annual rate of increase in average earnings will be 3 per cent from the effective date of the Plan throughout the whole period covered by the estimates and a second set on the assumption that such rate of increase will be 4 per cent.

3. *Development of average earnings rates*

The general pattern of development involved three steps, as follows:

Step 1 — estimation of the 1961 average earnings rate for paid workers in Canada excluding Quebec without taking account of the effect of any upper or lower limits on the earnings of individual workers;

Step 2 — breakdown of the average earnings rate developed in Step 1 into average earnings rates for males and females and for each age group and projection of the latter rates in accordance with assumed increases in average earnings;

Step 3 — development of modified average earnings rates, that is, average earnings rates taking account of the effect of the contributory earnings upper limit on individual earnings and the effect of excluding the earnings of workers having annual earnings less than the minimums allowable for contribution purposes.

Pertinent details are given in the following paragraphs.

Step 1—Average earnings rate for 1961

The 1961 income items shown in Schedule 2 below were based on statistics for all of Canada drawn from the Canadian Statistical Review for June, 1963, and on similar statistics for Quebec provided by D.B.S.

SCHEDULE 2

PERSONAL INCOME ITEMS FOR 1961 FOR CANADA EXCLUDING QUEBEC
(in millions)

Salaries, wages & supplementary labour income	Supplementary labour income	Net income received by farm operators from farm production	Net income of non-farm unincorporated businesses
$	$	$	$
14,095	633	779	1,767

The "supplementary labour income" item listed in Schedule 2 above comprises payments made by employers on behalf of their employees to provide them with future benefits, either definite or contingent, that is, payments such as employers' contributions to employee pension and welfare funds, to workmen's compensation and to the Unemployment Insurance Fund. Since a considerable part of such payments will not be subject to contributions under the Plan, it seemed proper to exclude the whole of this income item in order not to overestimate the contribution income. In consequence, total 1961 income for Plan purposes was taken to be

$$14{,}095 - 633 + 779 + 1{,}767$$
$$= \$16{,}008 \text{ million.}$$

(It should perhaps be made explicit that the total income figure of $16,008 million does not include military pay and allowances, an exclusion that accords with the exclusion of the armed services from coverage under the Plan.)

Division of the total income figure of $16,008 million by the corresponding 1961 civilian "paid worker" labour force figure of 4,601,000 gave an average earnings rate for 1961 of $3,479 for Canada excluding Quebec. This average earnings rate is some 3 per cent higher than the corresponding rate for all of Canada because of relatively low average earnings in Quebec.

For the financial estimates in this report, average earnings rates for all workers (including the unemployed from time to time) other than

members of the armed services and unpaid family workers were not used directly. The calculation procedures were so designed that the average earnings figures needed were average earnings rates for civilian paid workers excluding a number of unemployed persons determined in accordance with the assumption that a proportion of the labour force equivalent to the average rate of unemployment was unemployed for the whole year. For 1961, the average number of unemployed workers in Canada excluding Quebec was 301,000. The 1961 "aggregate" average earnings figure used for the development of average earnings rates by sex and age group for purposes of the estimates was, thus,

$$\frac{16{,}008}{4.3} = \$3{,}723.$$

Step 2—Average earnings rates by sex and age group

The main statistical bases for the breakdown of the "aggregate" average earnings rate by sex and age group were two sets of special tabulations prepared by D.B.S. from 1961 Census data—one set in respect of wage-earners only and the other set in respect of all paid workers other than self-employed farmers. These tabulations showed, for Canada and Quebec separately, numbers of workers and total reported earnings for the 12-month period ended June 1, 1961, classified by sex, age group and, except in one instance, earnings range. From these data, average earnings for each sex and relevant age group were computed for Canada excluding Quebec. The average earnings figures so determined were then related to the average earnings figure for the arbitrarily chosen male age group 45-54.

From the description of the data included in the special tabulations, it will be understood that the average earnings figures computed from the tabulated data were not average earnings rates but were, instead, averages of the actual earnings during a 12-month period of all workers whose reported earnings were included in the tabulations. For the younger male age groups and for almost all female age groups, where work participation is relatively low, movement in and out of the labour force results in relatively larger differences between average annual earnings rates and averages of actual annual earnings than for the relatively stable male age group 45-54. Thus, some upward adjustment of the computed relationships was required for the younger male age groups and for all female age groups so that the resulting relationships would be applicable to average earnings rates.

The proportions used for the breakdown of the "aggregate" average earnings rate by sex and age group are shown in Schedule 3 below.

In order to determine 1961 average earnings rates by sex and age group corresponding to the aggregate rate established in Step 1, there was required, besides the relationships shown in Schedule 3 below, a distribution by sex and age group of civilian paid workers excluding unemployed workers. Because all necessary statistics were not available for Canada excluding Quebec, the required distribution was developed from 1961 Special Survey statistics and 1961 Census data for all of Canada. It is shown in Schedule 4 below. The applicability of this distribution for civilian paid workers in Canada excluding Quebec was given support

SCHEDULE 3

AVERAGE EARNINGS RATES BY SEX AND AGE GROUP EXPRESSED AS PROPORTIONS OF THE AVERAGE EARNINGS RATE FOR THE MALE AGE GROUP 45-54

Age Group	Males	Females
	%	%
14-17	30	30
18-19	40	40
20-24	60	50
25-34	90	55
35-44	100	55
45-54	100	55
55-59	95	55
60-64	90	50
65-69	75	40
70 & over	60	30

SCHEDULE 4

DISTRIBUTION OF 1961 CIVILIAN PAID WORKERS BY SEX AND AGE GROUP

Age Group	Males	Females
	%	%
14-17	1.6	1.5
18-19	2.8	2.7
20-24	7.6	4.8
25-34	18.0	5.3
35-44	17.5	5.4
45-54	14.1	4.4
55-59	5.1	1.4
60-64	3.5	0.8
65-69	1.8	0.4
70 & over	1.1	0.2

by the generally satisfactory correspondence between distributions by sex and age group developed from the special D.B.S. tabulations for all of Canada and for Quebec separately.

From the distributions set out in Schedules 3 and 4 above, the 1961 average earnings rate for the male age group 45-54 corresponding to the "aggregate" average earnings rate of $3,723 was determined to be $4,798. Average earnings rates for all relevant age groups were then obtained by applying to $4,798 the proportions set out in Schedule 3 above.

For 1966, average earnings rates by sex and age group were determined by multiplying the average earnings rates for 1961 by the factor $(1.031)(1.035)(1.03)^3$, where 1.031 and 1.035 are the increase ratios in the D.B.S. "average weekly wages and salaries" statistic for the Industrial Composite classification from 1961 to 1962 and 1962 to 1963, respectively, and 1.03 is the assumed annual increase ratio from 1963 to 1966. For the years 1967 to 1975, average earnings rates were projected by multiplying the average earnings rates for the preceding year by 1.03 or 1.04, as applicable.

For illustrative purposes, average earnings rates, determined as explained in the above paragraphs, are shown for the years 1966, 1970 and 1975 in Schedule 5 below.

SCHEDULE 5

AVERAGE EARNINGS RATES OF CIVILIAN PAID WORKERS FOR CANADA EXCLUDING QUEBEC

Age Group	Rate of Increase in Average Earnings 3% per annum			4% per annum		
	1966	1970	1975	1966	1970	1975
	$	$	$	$	$	$
MALES						
18-19	2,245	2,526	2,928	2,245	2,626	3,195
20-24	3,368	3,790	4,394	3,368	3,941	4,795
25-34	5,052	5,687	6,593	5,052	5,910	7,191
35-54	5,614	6,318	7,324	5,614	6,569	7,992
55-59	5,333	6,003	6,959	5,333	6,239	7,592
60-64	5,052	5,687	6,593	5,052	5,910	7,191
65-69	4,211	4,739	5,493	4,211	4,925	5,992
FEMALES						
18-19	2,245	2,526	2,928	2,245	2,626	3,195
20-24	2,807	3,159	3,664	2,807	3,283	3,995
25-34	3,088	3,475	4,028	3,088	3,613	4,396
35-54	3,088	3,475	4,028	3,088	3,613	4,396
55-59	3,088	3,475	4,028	3,088	3,613	4,396
60-64	2,807	3,159	3,664	2,807	3,283	3,995
65-69	2,245	2,526	2,928	2,245	2,626	3,195

Step 3—Modified average earnings rates

In this final step is described how the average earnings rates, determined as described in Step 2 above, were modified to take account of the effect of the contributory earnings upper limit on individual earnings and the effect of excluding the earnings of otherwise eligible workers having annual earnings less than the minimums allowable for contribution purposes.

As a starting point, from Taxation statistics for the 1958, 1959 and 1960 taxation years were derived, for the "total employees" class, proportions of the number of employees and the amount of income falling within certain income ranges related to the average income for all employees. Proportions so determined are shown in Schedule 6 below.

From the relationships set out in Schedule 6 below augmented by relationships developed from the previously described special D.B.S. tabulations for income ranges below 40 per cent of average income, two continuous graphs were constructed, from one of which could be read off the percentage of workers in a group having earnings less than or equal to any specified amount of earnings (expressed as a proportion of average earnings for the whole group) and from the other, the percentage of total earnings arising from the earnings of such workers.

SCHEDULE 6

PROPORTIONS OF NUMBER OF EMPLOYEES AND TOTAL INCOME FALLING WITHIN DESIGNATED INCOME RANGES

Income Range expressed as multiples of average income for all employees	Number of Employees		Amount of Income	
	Proportion	Cumulative Proportion	Proportion	Cumulative Proportion
	%	%	%	%
3 to 4	0.84	99.34	2.95	95.62
2 to 3	4.19	98.50	9.76	92.67
1.5 to 2	10.07	94.31	17.11	82.91
1.25 to 1.5	11.88	84.24	16.20	65.80
1 to 1.25	16.04	72.36	18.01	49.60
0.8 to 1	13.61	56.32	12.26	31.59
0.6 to 0.8	13.29	42.71	9.31	19.33
0.4 to 0.6	11.84	29.42	5.91	10.02
0 to 0.4	17.58	17.58	4.11	4.11

The formula used to produce modified average earnings rates corresponding to the unmodified rates developed as described in Step 2 above was as follows:

$$\text{M.A.E.} = \frac{\text{A.E.}\ (1 - U^e - L^e)}{1 - L^n},$$

where

M.A.E. represents modified average earnings rates,

A.E. represents unmodified average earnings rates,

U^e represents the proportion of aggregate earnings excluded by reason of individual earnings exceeding the contributory earnings upper limit,

L^e represents the proportion of aggregate earnings excluded by reason of individual earnings amounting to less than the minimums allowable for contribution purposes,

L^n represents the proportion of paid workers excluded by reason of having earnings less than the minimums allowable for contribution purposes.

In Schedule 7 below are shown modified average earnings rates for the years 1966, 1970 and 1975 corresponding to the unmodified rates set out in Schedule 5 above. (*Note*: The contributory earnings upper and lower limits were assumed to be $5,000 and $600, respectively, for 1966 and 1967 and to increase thereafter to 1975 at a rate of 1½ per cent per annum.)

Because of the assumption that, after 1975, both the contributory earnings limits and average earnings will increase at a rate of 3 per cent per annum for one set of estimates and 4 per cent per annum for a second

SCHEDULE 7

MODIFIED AVERAGE EARNINGS RATES FOR CANADA EXCLUDING QUEBEC

Age Group	Rate of Increase in Average Earnings 3% per annum			4% per annum		
	1966	1970	1975	1966	1970	1975
	$	$	$	$	$	$
MALES						
18-19	2,492	2,746	3,101	2,492	2,815	3,288
20-24	3,240	3,536	3,946	3,240	3,594	4,100
25-34	3,875	4,169	4,549	3,875	4,196	4,667
35-54	3,997	4,290	4,673	3,997	4,316	4,779
55-59	3,936	4,232	4,621	3,936	4,255	4,722
60-64	3,875	4,169	4,549	3,875	4,196	4,667
65-69	3,621	3,919	4,317	3,621	3,955	4,434
FEMALES						
18-19	2,490	2,743	3,101	2,490	2,815	3,288
20-24	2,900	3,178	3,572	2,900	3,247	3,759
25-34	3,079	3,374	3,778	3,079	3,432	3,952
35-54	3,079	3,374	3,778	3,079	3,432	3,952
55-59	3,079	3,374	3,778	3,079	3,432	3,952
60-64	2,900	3,178	3,572	2,900	3,247	3,759
65-69	2,490	2,743	3,101	2,490	2,815	3,288

set, modified average earnings rates for each year after 1975 could be determined from the corresponding figures for 1975 by application of the appropriate power of the factor 1.03 or 1.04, as applicable.

APPENDIX 4

Contributions and Age Retirement Benefits

1. *General*

The method used for the development of contributions was, essentially, the same for both the short-range and the long-range estimates. It is described in section 2 below.

In the development of age retirement benefits, somewhat different methods were used for the short-range and the long-range estimates. Also, for the long-range estimates, three groups of contributors—classified by age at the effective date of the Plan—were treated separately for calculation purposes. The methods used are described in section 3 below.

2. *Development of contributions*

The development of contributions is described below in the form of a series of steps.

Step 1 — "Participating populations" for each year were obtained by multiplying the projected populations for each sex and age group by the assumed participation rates.

Step 2 — The participating populations obtained in Step 1 were multiplied by

(a) the applicable modified average earnings rates, and

(b) for 1966 and 1967—$600
for years after 1967—$600 increased by 1½ per cent for each year after 1967 until 1975 and 3 per cent or 4 per cent, as applicable, for each year thereafter.

Step 3 — Total contributory earnings were obtained by deduction of the amounts determined in (b) of Step 2 from those determined in (a) of Step 2 and by subsequent summation.

Step 4 — The totals were reduced by 1 per cent to take account of an overstatement arising from the use, in (b) of Step 2, of the average participating population instead of the population of workers who contribute at any time during the year.

Step 5 — The totals determined in Step 4 were allocated between salary and wages and self-employed earnings in the manner described in Appendix 2.

Step 6 — The short-range male totals for self-employed earnings were adjusted to take account of expected "lower-than-average" participation among self-employed farmers in the manner described in Appendix 2.

Step 7 — Contributions equivalent to a contribution rate of 1 per cent were obtained by multiplying the resulting totals by 0.01.

3. *Development of age retirement benefits*

(a) *Short-range estimates*

The following basic assumptions were used:

(i) no person who does not commence to contribute on the effective date of the Plan or who ceases to contribute after the effective date will subsequently contribute;

(ii) the probabilities of being a contributor at pertinent ages are as follows:

Age Last Birthday	Males	Females
56-59	0.81	0.24
60-64	0.72	0.18
65	0.49	0.13
66	0.46	0.11
67	0.43	0.09
68	0.40	0.08
69	0.37	0.07

(iii) a worker will elect to take his pension as soon as possible after ceasing to contribute—keeping in mind that the minimum ages at which age retirement pensions are available are 68 in 1967, 67 in 1968, 66 in 1969 and 65 in 1970 and later years.

The method of development is described in the following paragraphs by a theoretical step-by-step approach. In practice, the calculations were considerably simplified by the development of appropriate commutation type functions.

The first step in the development was the calculation of a series of $P_{(x,y,z)}$ factors—representing the probability that a worker aged x on January 1, 1966, will cease contributing at age y and will elect to take his age retirement pension at age z. Two cases had to be taken into account, namely,

(i) if z is the youngest age at which an age retirement pension can be taken, consistent with x and y, $P_{(x,y,z)}$ is the probability of ceasing contributions at age y, that is, the difference between the probability of being a contributor at age y-1 last birthday and the probability of being a contributor at age y last birthday (for example, for males, $P_{(64,66,67)} = 0.49 - 0.46 = 0.03$), and

(ii) if z is not the youngest age at which an age retirement pension can be taken, consistent with x and y, $P_{(x,y,z)}$ is zero.

The next step was the calculation of a series of $A_{(x,y,z)}$ factors—representing the average initial annual amount of pension payable to a worker aged x on January 1, 1966, who contributes until age y and who elects to take his pension at age z. This was done as follows:

(i) pensionable earnings for each year between ages x and y were taken to be the applicable modified average earnings rate;

(ii) the annual earnings ratio for each year was computed as pensionable earnings divided by the contributory earnings upper limit;

(iii) average earnings ratios were computed as one-tenth of the sum of the applicable annual earnings ratios;

(iv) $A_{(x,y,z)}$ was computed as 25 per cent of the average of the three contributory earnings upper limits ending with the year in which pension commences multiplied by the average earnings ratio.

The next step involved the calculation of a series of

$$P_{(x,y,z)} . A_{(x,y,z)} . (1.015)^{w-z}$$

factors. Such a factor, if applied to the population aged w last birthday in the year 1966+w−x, would yield the total amount of benefit payable to workers aged w last birthday in the year 1966+w−x who cease contributing at age y and elect to take pension at age z. By summation of all such factors for a given x and w, an aggregate factor was obtained which, when applied to the population aged w last birthday in the year 1966+w−x, would yield the total amount of benefit payable to workers aged w last birthday in the year 1966+w−x. Such aggregate factors were calculated for all relevant values of x and w.

The final step was the computation of total amounts of benefit by application of the aggregate factors to populations and adjustment of the male totals to take account of expected "lower-than-average" participation among self-employed farmers in the manner described in Appendix 2.

(b) *Long-range estimates*

(i) *Benefits for contributors under age 56 on January 1, 1966*

Very generally, the calculation method used was first to develop benefit factors for individual ages without taking account of future increases in average earnings, in the contributory earnings upper limit or in the Pension Index and then to construct composite benefit factors (for application to quinary population groups to produce amounts of benefit) by combination of the individual age factors and adjustment to take account of assumed increases in the aforementioned elements. The method is explained in more detail in the following paragraphs.

The first step in the development was the calculation of primary earnings factors. For 1966 and 1967, these primary earnings factors were equal to the modified average earnings rates for those years; for any year n from 1968 to 1975, the factors were equal to the modified average earnings rates for year n divided by $(1.015)^{n-1967}$; for all years after 1975, the factors were equal to the factors for 1975.

The next step was the calculation of primary benefit factors for individual ages x on January 1, 1966, by the formula

$$\text{P.B.F.} = \frac{0.25 \times (\text{total primary pensionable earnings—primary pensionable earnings dropped out})}{0.9 \times \text{number of years in primary contribution period} \times \text{disability drop-out factor}}$$

The element in the P.B.F. formula termed "total primary pensionable earnings" was calculated as the sum of the primary earnings factor multiplied by the corresponding participation rate for all ages between x and 65 (that is, during the primary contribution period).

For the element in the P.B.F. formula termed "primary pensionable earnings dropped out", which takes account of the 10 per cent drop-out provision, the minimum possible value is zero—a circumstance that would arise if no worker made contributions for more than 90 per cent of the primary contribution period. The maximum value of this element is the sum of the primary earnings factors multiplied by the corresponding participation rates for the n years for which this sum is lowest—where n represents 10 per cent of the primary contribution period. For males, "primary pensionable earnings dropped out" for each age x were assumed to equal approximately half of the maximum value. For females, because participation rates are much lower than for males and, thus, the true average value of "primary pensionable earnings dropped out" is likely to be much closer to the minimum than to the maximum, the slightly conservative assumption of a zero drop-out was chosen.

It may be noted that the fact that pensionable earnings after age 65 are not taken into account in the P.B.F. formula gives rise to a slight understatement of benefits. This inherent understatement is offset by slight overstatements in other areas of the calculations.

The element in the P.B.F. formula termed "primary contribution period" is a number of years equal to 65-x if x is 18 or over and 47 if x is less than 18.

The element in the P.B.F. formula termed "disability drop-out factor" was necessary to reduce the primary contribution period by the estimated average number of full calendar years during which a disability pension would be payable.

The next step was the calculation of primary composite benefit factors applicable to populations in the quinary age groups 70-74, 75-79, 80-84, 85-89 and 90 and over by interpolation between the values of the primary benefit factors for individual ages. The primary composite benefit factor applicable to the age group 70-74 in year n was assumed applicable to the age group 75-79 in year n+5, 80-84 in year n+10, and so on. The assumption underlying these factors is that a pension will be payable to all workers who have contributed at any time and have survived. Thus, the factors are not directly applicable to the age group 65-69 since not all workers within this age group will have ceased contributing and hence be entitled to a pension. To take account of this fact, the primary composite benefit factor for the age group 65-69 in year n−5 was taken to be equal to the corresponding factor for the age group 70-74 in year n multiplied by 0.5 for males and 0.75 for females.

The next step was the calculation of benefit increase factors by the formula

$$\text{B.I.F.} = (1.015)^{8\frac{1}{3}}\left[(1+i)^{m-1977} + (1+i)^{m-1976} + (1+i)^{m-1975}\right](1+j)^{n-m}$$

where

i represents the assumed annual rate of increase in average earnings and the contributory earnings upper limit after 1975, that is, 3 per cent or 4 per cent, as applicable,

j represents the assumed annual rate of increase in the Pension Index after 1975, that is, 1½ per cent for the "low cost" estimates and 2 per cent for the "high cost" estimates,

m represents the year in which the generation reaches the age group 65-69 (it is implicitly assumed that the average year in which pension commences is year m—corresponding to an average pension age of approximately 67½), and

n represents the year for which the calculation is made.

In brief explanation of the above formula, the function $(1.015)^8$ effects the increase up to 1975 in accordance with increases in the contributory earnings upper limit to that time. (It will be recalled that this limit is assumed to increase by 1½ per cent per annum for each year after 1967 until 1975). The function

$$\frac{1}{3}\left[(1+i)^{m-1977} + (1+i)^{m-1976} + (1+i)^{m-1975}\right]$$

continues the increase up to the year pension commences. (The three powers of $(1+i)$ represent the effect of using the average of the contributory earnings upper limits for the three years ending with the year in which pension commences in the determination of the amount of benefit.) The function $(1+j)^{n-m}$ effects the increase from the year in which pension commences to the year for which the calculation is made.

The next step was the calculation of adjusted composite benefit factors by multiplication of the primary composite benefit factors by the benefit increase factors.

The final step was the calculation of amounts of benefit by application of the adjusted composite benefit factors to the applicable populations.

(ii) *Benefits for contributors over age 60 on January 1, 1966*

From the short-range aggregate factors for individual ages, primary composite benefit factors were developed for age groups 75-79 and 80-84 in 1980, 80-84 and 85-89 in 1985, and so on, reasonable account being taken of the percentage distribution of the population by individual attained ages within each quinary age group.

Adjusted composite benefit factors were obtained by multiplication of the primary composite benefit factors by benefit increase factors, and amounts of benefit were determined by application of the adjusted composite benefit factors to the applicable populations.

(iii) *Benefits for contributors aged 56 to 60 on January 1, 1966*

This is a group of contributors intermediate to the groups treated in (i) and (ii) above in that most contributors within this group either can elect to have pension commence within the first ten years of operation of the Plan or can defer election for pension beyond the end of the first ten years.

The calculation method adopted was similar to that described in (ii) above with a modification to take account of the possibility of deferring pensions beyond the first ten years of operation of the Plan. The results produced by the adopted method blended smoothly into those for the younger and older age groups.

APPENDIX 5

Death and Survivors' Benefits

1. *General*

On the death of a contributor at an age less than 65, a death benefit and a widow's pension may become payable. On the disablement of a contributor at an age less than 65, a disability pension may become payable. The earnings-related parts of these benefits are determined as percentages of an earnings-related pension based on the pensionable earnings record of the contributor, calculated in the same way as for a contributor's age retirement pension except that the primary contribution period ends at the date of death or commencement of the disability pension instead of at age 65. Also, on the death of a contributor after age 65, an earnings-related death benefit and widow's pension related to the contributor's age retirement pension may become payable. Because of the dependence of the named benefits on an earnings-related pension based on the pensionable earnings record of the contributor, benefit factors common to the calculation of all of these benefits were developed. Their development is described in section 2 below.

Although the amount of death benefit cannot exceed 10 per cent of the contributory earnings upper limit applicable in the year of death, this limitation will have effect only with respect to contributors who consistently have had pensionable earnings close to the contributory earnings upper limit. In the development of death benefits, the limitation on the amount of benefit payable in respect of individual contributors was disregarded so that the benefits are slightly overstated from this aspect. The development is described in section 3 below.

Pensions payable to dependent disabled widowers will be relatively few and their financial significance will be small. For the current estimates, no direct provision was made for benefits payable to dependent disabled widowers. However, in the determination of widows' benefits, reductions or suspensions of widows' pensions by reason of widowhood at ages less than 45 were not taken into account. Thus, it was considered that there was a sufficient margin in the estimates for widows' benefits to cover benefits payable to dependent disabled widowers. The development of widows' benefits is described in section 4 below.

The total initial annual amount of benefit payable to the orphans of one contributor cannot exceed 25 per cent of the average of the contributory earnings upper limits for the three years ending with the year of the contributor's death. It may therefore be considered that there is an effective limitation on the number of children of one contributor to whom orphans' benefits may be payable. In the method used for the development of orphans' benefits, this limitation was disregarded. Also, it was implicity assumed in the calculation method that all males in the

population with children under age 18 would have contributions in a sufficient number of years for entitlement to orphans' benefits. Again, no account was taken of the fact that pensions are not payable to married orphans. The overstatement of benefits arising from the aforementioned aspects is at least partially offset by the effect of the calculation assumption that all orphans' benefits will cease at age 18 and by the fact that no allowance was made for the payment of benefits to the orphans of deceased female contributors. The development of orphans' benefits is described in section 5 below.

2. *General benefit factors*

(a) *Factors applicable where death or disablement occurs at an age less than 65*

For various individual ages on January 1, 1966, and various terminal ages (that is, ages at death or disablement), primary benefit factors were developed in the manner described for age retirement benefits in subdivision 3(b)(i) of Appendix 4 except that the primary contribution period was assumed to end at the terminal age instead of at age 65.

By interpolation between the primary benefit factors for individual ages, primary composite benefit factors were obtained for age groups 20-24, 25-29, . . . 55-59 and 60-64 for the years 1968, 1970, 1975 and quinquennial years thereafter.

Adjusted composite benefit factors were obtained by multiplication of the primary composite benefit factors by benefit increase factors that took account of increases in the contributory earnings upper limits up to the terminal years.

(b) *Factors applicable where death occurs at age 65 or over*

For deaths in the age group 70-74 in 1985, 70-74 or 75-79 in 1990, 70-74, 75-79 or 80-84 in 1995, and so on, both primary and adjusted composite benefit factors are identical with the corresponding factors for age retirement benefits.

For deaths in the age group 65-69 in 1980, 1985, and so on, primary and adjusted composite benefit factors are equal to the corresponding factors for age retirement benefits before multiplication by 0.5 for males and 0.75 for females. (It will be remembered that, for the age group 65-69, multiplication of the age retirement composite factors by 0.5 for males and 0.75 for females was necessary to allow for the fact that not all workers aged 65-69 who have contributed will be in receipt of age retirement pensions because some workers will still be contributing. This contingency is clearly not applicable in the case of deaths.)

For deaths in the age groups 65-69 and 70-74 in 1968 and 1970, 65-69, 70-74 and 75-79 in 1975, and so on, composite benefit factors were developed in a slightly different manner than the factors for age retirement benefits. The difference in development arose because

(i) the reduction in age retirement pensions by reason of commencement within the first ten years of operation of the Plan does not apply to earnings-related death and widows' benefits, and

(ii) the circumstance that age retirement pensions are not payable to all workers aged 65 to 69 because of continuation of contributions by some workers does not apply to earnings-related death and widows' benefits.

3. *Development of death benefits*

Numbers of deaths were developed for all of Canada and for Quebec separately for the years 1968, 1970 and 1975 and quinquennial years thereafter and the corresponding numbers of deaths for Canada excluding Quebec were obtained by simple subtraction. The development consisted of

(i) calculation of one-year probabilities of dying for quinary age groups 20-24, 25-29, . . . 85-89 and 90 and over in accordance with the mortality rates of the applicable (Canadian or Quebec) Life Tables, 1950-52 and 1955-57, and the projected mortality rates for the year 2000 and after,

(ii) determination of the corresponding one-year probabilities for the years 1968, 1970, and so on, by interpolation, and

(iii) application of the one-year probabilities to projected populations.

The amount of death benefit payable in respect of a deceased contributor is 50 per cent of the annual amount of an earnings-related pension based on the pensionable earnings record of the contributor with the primary contribution period ending at the date of death or at age 65, whichever is the earlier, subject to a limitation with respect to the maximum amount payable (which was disregarded for purposes of the estimates).

The total amounts of death benefit payable in 1968, 1970, 1975 and quinquennial years thereafter were determined by multiplication of the estimated numbers of deaths by the general benefit factors developed as described in section 2 above, summation of the results and division of the totals by two. The total amounts payable in each year 1969 and 1971 to 1974 were determined by interpolation between the corresponding totals for the years 1968, 1970 and 1975. Finally, the male totals for the years 1968 to 1975 were adjusted to take account of expected "lower-than-average" participation among self-employed farmers in the manner described in Appendix 2.

4. *Development of widows' benefits*

(a) *General*

The estimates for widows' benefits, developed as described in this section and as shown in the main body of the report, are in respect of benefits payable to widows in excess of the full amount of any disability or age retirement benefits that may also be payable. In practice, no adjustment was made in the calculations to take account of reductions in widows' benefits arising from the payment of both widows' and disability pensions since any resulting overstatement of benefits would be very small.

For the earnings-related part of widows' benefits, the general method of development was to construct for each year covered by the estimates certain populations of widows, as described hereinafter, and to apply average benefit factors to those populations. For the flat-amount part of

widows' benefits, the general method was to construct populations of widow beneficiaries aged less than 65 and to apply benefit factors to those populations. The details are given in the following subsections.

(b) *Earnings-related benefits*

(i) *Populations of widows*

The development of the required populations is outlined below in the form of a series of steps.

Step 1 — Numbers of females becoming widows in 1968, 1970, 1975, 1980 and decennial years thereafter by reason of the death of husbands who were not aged 68 or over at the effective date of the Plan were determined for each quinary age group of males. This was accomplished by multiplication of the following three factors:

A. number of male deaths—determined as described in section 3 above;

B. proportion married (for males)—derived from 1961 Census data and adjusted to take account of expected improvement in female mortality;

C. the constant 0.9—an adjustment to take account of the fact that married males are subject to lighter mortality than single males and widowers.

Step 2 — The groups of "new widows" were rearranged according to female age at widowhood. The rearrangement was based on an age distribution of wives by age of husband derived from 1961 Census data.

Step 3 — The groups developed in Step 2 were projected to produce numbers of surviving widows in each calendar year ending in 0 and 5 after the year of widowhood. The projections were made in accordance with the mortality rates described in Appendix 1 of this report and with the remarriage rates described in the paper "Remarriage Experience under the Pension Act of Canada" (Transactions of the Society of Actuaries, Volume XII).

Step 4 — For 1968, 1970 and each quinquennial year thereafter, groups of widows surviving from groups of females widowed in all preceding years from 1968 onward were produced from the groups of widows determined in Step 3 by interpolation. The resulting groups were classified according to age group at widowhood and duration from widowhood.

(ii) *Average benefit factors*

For the calculation of benefits to widows aged less than 65 in the year of calculation, the average benefit factors used were determined for all relevant groups of widows classified according to age group at widowhood and duration from widowhood as the weighted average of all applicable male "general benefit factors", described in section 2 above, multiplied by 37½ per cent and adjusted in accordance with assumed changes in the Pension Index from the year of widowhood to the year for which the calculation is made.

For the calculation of benefits to widows aged 65 or over in the year of calculation, average benefit factors were required that, in effect, excluded the average amount of age retirement pension payable to widows. (It will be remembered that, subject to a certain maximum, the total benefit available to a widow when both a widow's pension and an age retirement pension become payable is either 60 per cent of the widow's own age retirement pension plus 60 per cent of an earnings-related pension based on the pensionable earnings record of the deceased contributor or 100 per cent of the widow's own age retirement pension plus 37½ per cent of an earnings-related pension based on the pensionable earnings record of the deceased contributor, whichever is the greater.) The development of the factors is outlined below in the form of a series of steps.

Step 1 — Age retirement benefit factors for widows were produced in accordance with the assumption that age retirement benefits to all widows aged 65 or over commence at age 65. These factors were obtained by multiplication of "female" adjusted composite benefit factors similar to those developed for age retirement pensions by certain factors, varying by age at widowhood, that took account of the assumption that relatively more widows than married females will participate in covered employment.

Step 2 — Adjusted combined benefit factors that took account of the alternative benefits available when both a widow's pension and an age retirement pension become payable were developed from the factors A and B, where

A. represents the weighted average of general benefit factors, described in the first paragraph of this subdivision, adjusted in accordance with assumed changes in the Pension Index from the year of widowhood to the year of attainment of age 65 for cases where widowhood occurs prior to age 65, and

B. represents the age retirement benefit factor for widows, obtained in Step 1, adjusted in accordance with assumed changes in the Pension Index from the year of attainment of age 65 to the year of widowhood for cases where widowhood occurs after age 65.

For this step, it was assumed that any group of widows who had become widows at the same age and in the same calendar year would be composed of five sub-groups of widows with entitlement to an age retirement pension equal to k times the factor B, where k=0, ½, 1, 1½ and 2, respectively. For each such sub-group the factors

$$0.6\,(k \times B + A), \text{ and}$$

$$k \times B + 0.375 \times A$$

were compared and the greater of the two was used in the development of the adjusted combined benefit factors.

Step 3 — Average benefit factors for application to populations of widows were produced by subtraction of the factors B from the adjusted

combined benefit factors and by adjustment in accordance with assumed changes in the Pension Index from the later of the year of widowhood or the year in which an age retirement pension commences to the year for which the calculation is made.

(iii) *Computation of benefits*

Total widows' earnings-related benefits were computed for the years 1968, 1970, 1975 and quinquennial years thereafter by multiplication of the developed populations by the applicable average benefit factors. Corresponding benefits for the years 1969 and 1971 to 1974 were determined by interpolation between the totals for the years 1968, 1970 and 1975. Finally, the totals for the years 1968 to 1975 were adjusted to take account of expected "lower-than-average" participation among self-employed farmers in the manner described in Appendix 2.

(c) *Flat-amount benefits*

(i) *Populations of widow beneficiaries aged less than 65*

The required populations were obtained by application of estimated proportions of widows entitled to widows' benefits to the populations of widows obtained in Step 4 of subdivision (b)(i) above. The proportions used were determined for each calendar year of widowhood and each age group of new widows on the basis of rough estimates of proportions of husbands who will make contributions under the Plan. They are shown in the following schedule.

PROPORTIONS OF WIDOWS ENTITLED TO BENEFITS

Year of Widowhood	Widow's Age at Widowhood			
	Under 50	50–54	55–59	60–64
	%	%	%	%
1968	90	85	80	75
1970	95	90	85	80
1975	95	95	90	85
1980	95	95	95	90
1985 and after	95	95	95	95

(ii) *Benefit factors*

The flat-amount part of a widow's pension is totally dependent on the year of payment. For any year of calculation, the benefit factor used was equal to $300 increased in accordance with assumed changes in the Pension Index from 1967 to the year for which the calculation is made.

(iii) *Computation of benefits*

Total widows' flat-amount benefits were computed for the years 1968, 1970, 1975 and quinquennial years thereafter by multiplication of the developed populations by the applicable benefit factors. Corresponding benefits for the years 1969 and 1971 to 1974 were determined by interpolation between the totals for 1968, 1970 and 1975. Finally, the totals for

the years 1968 to 1975 were adjusted to take account of expected "lower-than-average" participation among self-employed farmers in the manner described in Appendix 2.

5. *Development of orphans' benefits*

One important point that should be kept in mind is that neither the death nor the remarriage of a widowed mother affects the payment of orphans' pensions.

The broad assumption on which the development of orphans' benefits was based was that a pension of $25 per month, adjusted in accordance with assumed changes in the Pension Index from 1967 to the year for which the estimates apply, will be payable to each child under age 18 of every male contributor who dies after 1967 and that no pension will be payable under any other circumstances.

The general method of development of orphans' benefits was to determine, for each year covered by the estimates, the population of children under age 18 who were left orphans by reason of the death of their "contributor" fathers after 1967 and to apply to such populations appropriate benefit factors. The details are given below in the form of a series of steps.

Step 1 — A distribution of fathers of new born children, according to age, was obtained by averaging such distributions for Canada for the five years 1958 to 1962. (The source of information was the D.B.S. publication "Vital Statistics".)

Step 2 — Percentages of fathers who survive 5 years, 10 years, 15 years and 20 years after the birth of a child were produced by application of five-year survival factors based on the Canadian Life Table, 1960-62, to the distribution obtained in Step 1.

Step 3 — Complements of the percentages determined in Step 2 were computed. These complements represent the probabilities—in accordance with the Canadian Life Table, 1960-62—that the father of a child aged 5 years, 10 years, 15 years or 20 years will have died.

Step 4 — Probabilities corresponding to those described in Step 3 were determined on the basis of the projected mortality rates for the year 2000 and after.

Step 5 — From the probabilities determined in Steps 3 and 4, probabilities that the father of a child in the age groups 0-4, 5-9, 10-14 and 15-17 in 1968, 1970, 1975 and quinquennial years thereafter will have died after 1967 were developed by interpolation.

Step 6 — Numbers of orphans under age 18 whose fathers will have died after 1967 were obtained for the years 1968, 1970, 1975 and quinquennial years thereafter by application of the probabilities developed in Step 5 to the pertinent populations.

Step 7 — Total benefits payable in 1968, 1970, 1975 and quinquennial years thereafter were obtained by multiplication of the numbers developed in Step 6 by $300 increased in accordance with assumed changes in the Pension Index from 1967 to the year for which the calculation is made.

Step 8 — Total benefits payable in the years 1969 and 1971 to 1974 were obtained by interpolation between the total amounts developed in Step 7 for the years 1968, 1970 and 1975.

Step 9 — Totals for the years 1968 to 1975 were adjusted to take account of expected "lower-than-average" participation among self-employed farmers in the manner described in Appendix 2.

APPENDIX 6

Disability Benefits

1. *General*

To qualify for a disability pension under the Canada Pension Plan, a contributor must be physically or mentally incapacitated to such an extent that he cannot regularly pursue any substantially gainful occupation and the disability must be of such nature that it is likely to be long continued and of indefinite duration or is likely to result in death.

The disability experience that will evolve under the Plan will depend not only on such factors as improvements in medical techniques, measures taken to prevent accident and disease and measures taken to rehabilitate disabled persons but also, to a significant extent, on the way in which the disability provisions of the Plan are interpreted and administered. It will therefore be clear that, until actual experience develops under the Plan, predictions of disability rates for the purposes of financial estimates must be viewed as broad approximations only.

A careful study of Canadian statistics relating to long-term disability, namely, Census data at decennial intervals, statistics from the Canadian Sickness Survey, 1950-51, and statistics developed from experience under the Disabled Persons Act, disclosed little information that seemed directly pertinent to probable future experience under the Canada Pension Plan. Thus, for purposes of the current estimates, disability rates were based almost wholly on disability experience that has developed under the OASDI system of the United States and on projections based on that experience.

To estimate the flat-amount part of disability pensions payable in any future year, the general method used was to develop for such year populations of disabled beneficiaries based on assumed proportions insured for disability benefits and disability prevalence rates and to apply benefit factors to those populations. The choice of proportions insured for disability benefits and prevalence rates, the development of benefit factors and the final computation of flat-amount benefits are described in section 2 below.

To estimate the earnings-related part of disability pensions payable in any future year, the general method used was to develop for such year average benefit factors for application to total population groups. Very generally, such average benefit factors were based on estimates of aggregate contributions made in respect of all beneficiaries in receipt of disability pensions. The development of these factors and the final computation of earnings-related benefits are described in section 3 below.

The methods described in the sections that follow apply almost completely to the development of benefits for years from 1975 onward. For 1970—the year in which disability pensions first become payable

under the Plan—populations of disabled beneficiaries were developed by application of disability incidence rates based on experience under insurance contracts to estimated population groups of contributors insured for disability benefits at the beginning of the year. The amount of benefit payable in 1970 was calculated as 20 per cent of an amount of benefit determined by multiplication of the developed populations by estimated average annual amounts of benefit applicable for that year. The 20 per cent factor took account of the fact that disability pensions in respect of disablements in January, 1970, will be payable for a maximum of eight months during the year, pensions in respect of disablements in February for a maximum of seven months, and so on. (A basic underlying assumption was that disablements will be distributed uniformly over the calendar year.) For the years 1971 to 1974, total amounts of benefit were determined by interpolation between the totals for 1970 before multiplication by the 20 per cent factor and the totals for 1975 determined as described hereinafter. Finally, for the years 1970 to 1975, the male totals were adjusted to take account of expected "lower-than-average" participation among self-employed farmers in the manner described in Appendix 2.

2. *Flat-amount benefits*

(a) *Proportions insured for disability benefits*

Under the Canada Pension Plan the eligibility requirements for entitlement to disability benefits are much more stringent than those for entitlement to death and survivors' benefits mainly because of the "recency of contributions" test which is required only with respect to disability benefits. (Because of the "recency of contributions" test, for any group of persons where participation in gainful employment is relatively low and movement into and out of the labour force is relatively frequent, the proportion insured for disability benefits will be significantly less than the proportion insured for other benefits. This fact is particularly applicable to female workers.) Under the OASDI system of the United States, the eligibility requirements for entitlement to benefits follow a similar pattern to those for the Canada Pension Plan; under that programme, a worker insured for disability benefits not only must have the "fully insured" status required for entitlement to other benefits but also must satisfy a "recency of contributions" test. It was therefore considered that proportions insured for disability benefits under the U.S. programme would be relevant for purposes of the current estimates for the Canada Pension Plan.

For recent estimates for the OASDI system, the U.S. actuaries assumed that the proportions of total population groups who are "fully insured" are currently of the order of 90 per cent for males and 50 per cent for females. At the same time, they assumed that the proportion of "fully insured" workers who are insured for disability benefits is, for most age groups over age 24, currently about 86 per cent for males and 40 per cent to 60 per cent for females. Thus, for the OASDI estimates, there is an implied assumption that the proportion of total population groups over age 24 who are insured for disability benefits is of the general

order of 75 per cent to 80 per cent for males and 20 per cent to 30 per cent for females.

The proportions assumed to be insured for disability benefits for the current estimates for the Canada Pension Plan are shown in Schedule 1 below.

SCHEDULE 1

PROPORTIONS OF TOTAL POPULATIONS INSURED FOR DISABILITY BENEFITS

Class of Estimates	Age Group			
	22–24	25–29	30–59	60–64
	%	%	%	%
MALES				
All classes	20	75	90	85
FEMALES				
High cost	20	30	30	25
Low cost:				
1970 and 1975	20	30	30	25
1980 and 1985	20	30	35	30
1990 and after	20	35	40	35

(b) *Prevalence rates*

With respect to long-term disability, the general impression is that disability rates are higher for females than for males. However, on the basis of the Canadian disability statistics mentioned previously, it appears that total numbers of disabled males and females in Canada are about equal. Also, although for early cost estimates with respect to disability coverage under the OASDI system the U.S. actuaries assumed that disability rates would be much higher for females than for males, they have recently used prevalence rates for females that are 75 per cent of those for males. For the current estimates under the Canada Pension Plan, it was assumed that prevalence rates would be the same for both males and females.

To conform with the disability provisions of the Canada Pension Plan and the calculation methods chosen for the estimates, the disability prevalence rates required were proportions of workers insured for disability benefits to whom disability pensions are payable. The prevalence rates used by the U.S. actuaries were defined as proportions of workers insured for disability benefits who are disabled-worker beneficiaries. Thus, the U.S. ultimate male prevalence rates could reasonably be considered to be applicable for determination of populations of disabled beneficiaries under the Canada Pension Plan for the year 2000 and after. The rates used are shown in Schedule 2 below.

(c) *Adjustments required during an interim period*

The proportions insured for disability benefits described in (a) above and the prevalence rates described in (b) above did not take account of necessary exclusions from the calculations of disablements occurring prior to 1970 for which there can be no entitlement to pension. Thus, adjust-

SCHEDULE 2

ULTIMATE PREVALENCE RATES

Age Group	Rate
	%
22-24	0.05
25-29	0.14
30-34	0.38
35-39	0.70
40-44	1.15
45-49	1.69
50-54	3.18
55-59	5.13
60-64	9.30

ments were required for the early stages of the Plan. The method chosen to effect such adjustments was to use a series of interim prevalence rates varying by time elapsed after 1969. These interim prevalence rates were related to the ultimate prevalence rates by means of ratios of interim to ultimate rates developed in accordance with disability incidence and termination rates based on experience under insurance contracts. The interim rates for quinquennial years 1975 to 1995 are shown in Schedule 3 below.

SCHEDULE 3

INTERIM PREVALENCE RATES

Age Group	Year 1975	1980	1985	1990	1995
	%	%	%	%	%
22-24	0.05	0.05	0.05	0.05	0.05
25-29	0.12	0.14	0.14	0.14	0.14
30-34	0.30	0.36	0.38	0.38	0.38
35-39	0.50	0.62	0.68	0.70	0.70
40-44	0.82	1.00	1.08	1.13	1.15
45-49	1.17	1.45	1.57	1.64	1.67
50-54	2.19	2.73	2.96	3.08	3.15
55-59	3.54	4.46	4.82	4.98	5.08
60-64	6.14	8.09	8.74	9.02	9.21

(d) *Benefit factors*

The flat-amount part of a disability pension is totally dependent on the year of payment. The applicable benefit factor for any year of calculation is $300 increased in accordance with assumed changes in the Pension Index from 1967 to such year.

(e) *Computation of benefits*

For each sex and age group, the amount of benefit was computed for each quinquennial year commencing with 1975 as

number in total population × proportion insured for disability benefits × prevalence rate × benefit factor.

Total amounts of benefit were obtained by summation.

3. *Earnings-related benefits*

(a) *Average benefit factors*

The earnings-related part of a disability pension payable in any year depends on

(i) the calendar year in which the pension commenced—since the initial amount of pension is dependent on the contributory earnings upper limit for that year and the preceding two years,

(ii) the percentage change in the Pension Index from the year in which the pension commenced—since pensions in payment are adjusted in accordance with changes in the Pension Index, and

(iii) the age of the contributor at the date of commencement of pension—since earnings vary by age.

If all disability pensions payable in any year commenced in that year, earnings-related disability benefits could reasonably be determined in the same manner as that described for death benefits since the latter benefits depend on the calendar year and the age of the contributor at the time the benefit becomes payable. While the assumption of zero duration for all disability benefits in payment will not be in accordance with actual experience, it was considered that the resulting overstatement of benefits determined in accordance with that assumption would not be unacceptably large both because a very high proportion of disability pensions payable in any year will be at the shorter durations and because, for persons with similar earnings records, amounts of pension emerging in any year will not be far different from those in payment at all except the longest durations.

There are two reasons for the concentration of benefits at the shorter durations. In the first place, since disability incidence rates increase sharply with increasing age, for persons in any age group at a certain date more disability pensions will have started during the year ended with that date than in the preceding year, more in the preceding year than in the second preceding year, and so on. Secondly, since disability termination rates are high (and, for the Canada Pension Plan, since disability pensions automatically cease at age 65) comparatively few persons survive as disability pensioners at the longer durations.

As respects the variation in amounts of pension by duration, for some sample calculations the amount of an emerging pension was found to be greater by about 7 per cent and 14 per cent, respectively, than the amounts of corresponding pensions that had commenced five years and ten years earlier.

In accordance with the assumption that the annual amount of a disability pension at any duration from commencement of pension would be equal to the annual amount of a corresponding disability pension commencing in that year, the benefit factor applicable to a given sex and age group of the total population for any year of calculation was obtained by multiplication of the following three elements:

A. 75 per cent of the general benefit factor determined as described in section 2 of Appendix 5;

B. a reduction factor approximately equal to the ratio of the aggregate contributions made in respect of the members of the group who are insured for disability benefits to the aggregate contributions made in respect of all members of the group;

C. the disability prevalence rate shown in Schedule 2 or 3 above, as applicable.

In brief explanation of the make-up of the average benefit factor, application of 75 per cent of the general benefit factor to the pertinent total population group produces a total amount of benefit that would be applicable if a disability pension were payable to all contributors in that group. Application of the reduction factor effectively reduces the population of contributors implicit in the general benefit factor to a population of contributors insured for disability benefits and, at the same time, takes account of the fact that average contributory earnings for contributors insured for disability benefits will be higher than the average contributory earnings for all contributors. (For males, the reduction factor used for all classes of estimates was 90 per cent. For females, for the "high cost" estimates the reduction factor used was 75 per cent and for the "low cost" estimates was 75 per cent for 1970 and 1975, 80 per cent for 1980 and 1985 and 85 per cent for 1990 and quinquennial years thereafter.) Application of the prevalance rate effectively reduces the population of contributors insured for disability benefits to a population of disabled beneficiaries.

(b) *Computation of benefits*

For each sex and age group, the amount of benefit was computed for each quinquennial year commencing with 1975 as

number in total population $\times$ average benefit factor.

Total amounts of benefit were obtained by summation.