

**TRANSACTIONS OF SOCIETY OF ACTUARIES  
1951 VOL. 3 NO. 7**

**THE RETIREMENT ANNUITIES ACT OF  
THE GOVERNMENT OF ALBERTA**

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**T**HE Retirement Annuities Act of the Government of Alberta came into force on July 1, 1951 (Chapter 4 of the Statutes of Alberta 1951). The Act establishes an Annuity Fund for the issue of retirement annuities to residents of Alberta.

Two main purposes are served by the Act. The means are provided by which any Canadian citizen who has been resident in the Province of Alberta for the past three years may purchase a retirement income on very attractive terms. Further, the funds received under the Act will be loaned to municipalities for local improvements, at lower rates of interest than could be obtained on their own security.

The new Act is unique in several respects. The Dominion Government has issued annuities since 1908, but this is the first time a Provincial Government has entered the field. Withdrawal of deposits in cash but without interest is allowed under certain conditions, the Government making a profit of the interest on sums withdrawn and also in the event of the death of a depositor before the annuity commences. These profits will to some extent reduce the Government subsidy involved in the interest provisions. After a depositor reaches age 60 a remarkably wide choice is allowed of annuity commencement date and type of annuity. The annuity rate tables are, it is believed, the first tables making specific allowance for improving mortality by the use of separate rates depending on the year of birth.

A SUMMARY OF THE ACT AND REGULATIONS

*Eligibility*

The Act provides that any Canadian citizen with three years' residence in the Province may purchase a retirement annuity by depositing in the Annuity Fund an initial amount of not less than \$10 and that additional deposits may be made at any time thereafter. By the Regulations, the depositor must have resided in Alberta for three years immediately before making the initial deposit and additional deposits must be in amounts of not less than \$5.

*Maximum Annuity*

The maximum annuity that may be purchased is \$1,500 per annum commencing at age 60 on a single life basis, or the actuarial equivalent

thereof. Thus the maximum permitted amount in the account of a depositor now aged 60 is \$19,862.75 if male or \$22,122.50 if female. At higher ages the maxima would be these amounts increased by compound interest for the years beyond age 60. The Regulations provide that any excess deposited is returnable without interest.

### *Interest*

Interest will be credited on deposits at  $3\frac{1}{2}\%$  per annum from the last day of the quarter in which the deposit was made, and interest will be compounded annually on March 31st. Interest will be credited at the same rate for the period between the last compounding day and the date of the commencement of the annuity.

If at any time the rate of interest is reduced by amending the Act the reduction will not apply to purchasers who made the initial deposit before the date of the change.

### *Selection of Annuity*

The purchaser may select an annuity commencement date after age 60 and the type of annuity by giving not less than one month's notice to the Deputy Provincial Treasurer's Office and providing proof of age. The purchaser may select a Single Life Annuity, a Joint Life Annuity, or a Guaranteed Term Life Annuity for a term of not less than 5 years. Annuities will be paid annually, semiannually, quarterly or monthly in arrears and all annuities are apportionable to the date of death. By Regulation, the annuities may commence only on the first day of the month and Guaranteed Term Annuities must be for terms of 5, 10, 15 or 20 years.

### *Annuity Reserve Account*

At the annuity commencement date the amount in the purchaser's account with interest will be transferred to the Annuity Reserve Account from which annuities will be paid. The Annuity Reserve Account will be credited with compound interest at  $3\frac{1}{2}\%$  per annum.

The amount of annuity will be computed at the annuity commencement date on the table in effect on the date when the purchaser made the initial deposit in his annuity account.

### *Death Before Retirement*

In the event of death before the annuity commencement date, all deposits with 3% *simple* interest to the date of death will be payable to the purchaser's estate. The difference between the interest credited to the purchaser's account and simple interest at 3% will be transferred to the Account of Revenue from the investments of the Fund.

### *Withdrawals*

All or part of the deposits in a purchaser's account may be withdrawn provided they have been in the Fund for at least 5 years, but the interest on money withdrawn will be forfeited by the purchaser. For the purpose of calculating the interest on money withdrawn, the money deposited last which has been in the purchaser's account for at least five years shall be deemed to be withdrawn first. Any interest on money withdrawn shall be transferred to the Revenue Account.

### *Regulations*

The Lieutenant Governor in Council may make regulations adopting tables for determining the values of annuities and regulations for proving the age, identity, citizenship and residence of purchasers and for facilitating the administration generally.

### *Investment of Annuity Fund Monies*

The Provincial Treasurer shall invest the monies in approved debentures, bonds or other securities of municipalities (that is, of any city, town, village, county or municipal district) in the Province. Where no such securities are available, monies may be temporarily invested in Dominion or Provincial bonds. The interest charged to municipalities on the securities purchased by the Fund shall be at such a rate as may be fixed by the Lieutenant Governor.

It is understood from statements by Government spokesmen that the present intention is to fix the interest rate on such loans at 3% per annum.

## THE FINANCIAL ARRANGEMENTS

It will be seen that three main accounts are necessary to operate the Annuities Act.

1. The Purchasers' Annuity Accounts, consisting only of the deposits with 3½% compound interest of those whose annuities have not yet commenced
2. The Annuity Reserve Account, to which deposits and interest are transferred when the annuity commences, and from which annuities are paid
3. The Revenue Account of income from investments in the above Funds

It is clear that the Purchasers' Annuity Accounts operate as simple sinking funds with a Government guaranteed rate of interest. Hence no actuarial surplus or deficiency can arise in these Accounts.

On the other hand the Annuity Reserve Account receives the total amount to the purchaser's credit when his annuity commences, and the annuity is paid out of this account. Hence a surplus or deficiency may arise if the mortality of matured annuities is more or less favourable than

expected. Thus periodical actuarial valuations will be necessary. It is presumed that any deficiency would be made good by the Province under its general guarantee of the annuities.

While the Annuity Reserve Account bears the risks involved in the annuitant mortality assumptions in respect of matured annuities, other profits and losses are reflected in the accounts of revenue derived from the investments of the Fund. From the Revenue Account  $3\frac{1}{2}\%$  interest must be credited to the Purchasers' Annuity Accounts and the Annuity Reserve Account. It has been decided that the investments with local authorities will probably be based on a 3% interest rate and allowing for money temporarily uninvested, or invested in Dominion and Provincial bonds, it seems to be contemplated that the over-all yield will not be greater than 3%. It appears therefore that, apart from the sources of revenue mentioned below, a Government subsidy of about  $\frac{1}{2}\%$  per annum of the amount of the total funds will be required from General Revenue.

However, the Revenue Account will also receive the profits due to deaths and to money withdrawn. In the event of death the difference between  $3\frac{1}{2}\%$  compound interest credited to the purchaser's account and 3% simple interest paid on death will be transferred to the Revenue Account. In the event of withdrawal of all or part of the deposited money the interest on the amount withdrawn will be transferred to the Revenue Account.

The expenses of administering the Plan will fall entirely on the General Revenue of the Government. Further the Government will stand to gain or lose from the profits or losses arising from mortality of pensioners, but no special provision has yet been made for dealing with such profits or losses.

#### EMPLOYEE RETIREMENT PLANS

The Dominion Government has developed group annuity contracts and a pooled accounting system under which Dominion Government annuities may be conveniently used by employers for company retirement plans. There are no similar provisions in the Alberta Annuities Plan. However, it is understood that, under the Regulations, deposits may be made by one person for another—by a parent for a child, a husband for a wife or an employer for an employee—and it is natural that employers in Alberta will wish to make use of the very favourable annuity rates if this should be possible.

The two main problems in covering groups are:

1. Only Canadian citizens resident in Alberta for three years are eligible for the annuities. Thus if some of the employees are not Canadian citizens, a second underwriter will have to be brought in. A three-year eligibility requirement

for membership of the pension plan would avoid any difficulty on the residence qualification, except in the case of firms with branches or representatives outside Alberta.

2. The Act clearly indicates that the "purchaser" and the "annuitant" are the same person, and hence it appears that all deposits made for an employee are immediately and fully vested in him or her. Once the money is deposited, it is impossible for the employer to receive back, directly or indirectly, any savings due to deaths before retirement or terminations of employment.

A number of retirement plans exist on a self-administered trustee basis, with a provision that at the retirement date annuities must be purchased from an insurance company or other approved source. Effective use could be made of the Alberta Annuities Act in this type of plan. Further if the Plan is contributory it might be of advantage for all employee contributions to be paid directly to the Alberta Government.

Another method would be for the employer to commence payments to the Alberta Government at the time when vesting occurs, whether or not the employer builds up reserves before that time (under the regulations of the Canadian Department of National Revenue vesting must occur after 20 years if the employee has attained age 50, but partial or full vesting at earlier dates is fairly common).

Whatever the details of the financing, there seems little doubt that the reduction of cost which is possible will lead to the development of employee retirement plans qualifying for the approval of the tax authorities and making use of the new annuities.

#### THE ACTUARIAL PROBLEM

The provisions of the Act have been summarized above. The actuarial problem was to determine tables of annuity rates for practical use within the framework of the Act which had already been passed.

In view of the fact that the Alberta Government expects to subsidize the plan in order to guarantee the interest rate of  $3\frac{1}{2}\%$ , it was felt that the mortality assumptions should be conservative, so as to reduce to the minimum the risk that mortality losses would necessitate additional subsidies from the Government. It follows that consideration had to be given to the trend towards improving mortality; and the rates finally adopted allow for this factor by varying according to the year of birth.

A purchaser who makes an initial deposit of \$10 secures for himself a valuable option. To take an extreme example, a child age 3, for whom an initial deposit is made in 1951, is entitled to purchase an annuity of \$1,500 per annum at or after the age of 60, that is the year 2008, at the rates prevailing when the initial deposit was made. In view of this it was

thought essential to protect the Fund against the effect of improving mortality over many years in the future. The preparation of the Annuity Rate Tables therefore fell into two parts.

1. Determination of the mortality tables appropriate for the purchase of annuities commencing in 1951 (or for lives born in 1890 and earlier)
2. Allowance for improving mortality in respect of annuities commencing in future years (or for years of birth after 1890)

#### PRESENT DAY MORTALITY OF PENSIONERS

The mortality basis was first determined which was appropriate for pensioners whose annuities commence in the year 1951.

The latest available information of annuitants' mortality under the Dominion Government Annuities Plan is a study for the years 1943 to 1948. The Dominion Government Annuities' experience, which centers around the year 1946, was first adjusted to allow for the estimated improvement which has taken place in annuitant mortality in the five years up to 1951. An adjustment was also made for the expected improvement during the lifetime of pensioners who effected annuities in 1951.

A further adjustment was necessary owing to the fact that the expectation of life in the Prairie Provinces is considerably greater than in Canada as a whole.

The figures (Table 1) given by the Dominion Bureau of Statistics based on the 1941 Canadian Census show that mortality in the Prairie Provinces is between 16% and 6% less than in the Canadian general population at the ages which are of importance (and indeed is considerably less throughout life). One important reason for this feature is the tendency for the older lives in Alberta, particularly those who are disabled and unable to work, to migrate to other Provinces. Hence the lower mortality in the Prairies may be to a considerable extent due to the selection arising from this movement of population. Further since annuitants are self-selected lives and mortality variations are greatest among the least healthy lives it is to be expected that the differential among those purchasing annuities would be less than among the general population. It is also recognised that once a purchaser has qualified to make an initial deposit he or she may migrate out of Alberta without forfeiting any rights under the Act.

However, it would seem unwise to ignore altogether the better experience in the Prairies and accordingly the mortality rates were decreased by approximately 4% to allow for the longer life that may be expected among Prairie residents as compared with the Canadian general population. It must be admitted that this allowance is quite arbitrary but some such adjustment was thought necessary in the interest of conservatism.

The effect of the various adjustments is shown in Table 2.

The Dominion Government Annuity experience after these adjustments was compared with the various tables given in the paper by W. A. Jenkins and E. A. Lew, "A New Mortality Basis for Annuities." As a result it was found appropriate to adopt for males whose annuities com-

TABLE 1  
COMPLETE EXPECTATIONS OF LIFE AND MORTALITY RATES  
IN CANADA AND IN THE PRAIRIE PROVINCES BASED ON  
THE POPULATION IN 1941 AND THE DEATH RATES IN  
1940-42

AGE	COMPLETE EXPECTATIONS OF LIFE			
	Males		Females	
	Canadian Life Tables	Life Table for Prairie Provinces	Canadian Life Tables	Life Table for Prairie Provinces
60.....	16.06	16.82	17.62	18.26
65.....	12.81	13.35	14.08	14.62
70.....	9.94	10.28	10.93	11.39
75.....	7.48	7.77	8.19	8.57
80.....	5.54	5.76	6.03	6.38
85.....	4.05	4.23	4.35	4.66
90.....	2.93	3.19	3.13	3.33
	MORTALITY RATES			
60.....	.0203	.0170	.0153	.0135
65.....	.0309	.0263	.0243	.0223
70.....	.0476	.0443	.0381	.0350
75.....	.0755	.0713	.0636	.0599
80.....	.1174	.1110	.1020	.0957
85.....	.1740	.1683	.1578	.1446
90.....	.2504	.2393	.2339	.2152

Source: Life Tables for Canada and Regions, Dominion Bureau of Statistics.

mence in 1951 the *a*-1949 (*m*) Table Projected 10 Years and for females whose annuities commence in 1951 the *a*-1949 (*f*) Table.\*

It will be observed that these tables were adopted without allowance for projection during the lifetime of the annuitants. Theoretically it would be better to adopt certain of the Jenkins-Lew tables as representing the mortality in 1951, instead of the mortality of those whose annuities commence in 1951, but from a practical standpoint it appeared simpler to use

\* See paragraph number 4 of the report of the Secretary-Treasurer on page 664.

tables without projection which were considered on the average to give the appropriate annuity values.

In order that the final tables could be expressed on a year-of-birth basis these annuity values were then taken as being appropriate for lives born in 1890 and earlier.

## IMPROVING MORTALITY

There is an impressive body of statistics showing the steady improvement in mortality which has accompanied the medical advances and the

TABLE 2  
ANNUITY VALUES FOR LIFE AT 3½% INTEREST

AGE	Dominion Government Experience 1943-1948	Mortality Reduced for Prairie Differential	Mortality Projected to 1951	Allowing for Improvement during Annuitant's Lifetime	Jenkins-Lew a-1949 (m) Table Projected 10 Years	Jenkins-Lew a-1949 (f) Table
MALES						
60.....	12.13	12.31	12.48	12.79	12.74	.....
65.....	10.29	10.46	10.60	10.81	10.86	.....
70.....	8.39	8.55	8.67	8.79	8.95	.....
75.....	6.41	6.57	6.65	6.70	7.07	.....
FEMALES						
60.....	13.68	13.84	13.96	14.23	.....	14.25
65.....	11.67	11.83	11.95	12.13	.....	12.25
70.....	9.51	9.67	9.76	9.87	.....	10.17
75.....	7.45	7.61	7.68	7.73	.....	8.09

improving social conditions of the last half century. There is every reason to believe that this trend will continue and it is therefore necessary to consider the effect of the lengthening of life on the rates that should be charged for annuities under the Act.

The general effect of the improvement is that the value of an annuity at the usual retirement ages increases by nearly ¼% each year. Hence if the tables recommended above for annuities commencing in 1951 were used to calculate the cost of deferred annuities which will not commence for 40 years, the Government might expect to take a loss of about 10% of the annuity purchase money.

A single annuity table, not allowing for improving mortality, cannot be

used without resulting in great inequities between purchasers at younger and older ages. If a single table were chosen, appropriate for those purchasing immediate annuities in the near future, it would involve the Government in losses of 10% or more on the deferred annuity purchases; and if the table chosen were appropriate for those purchasing deferred annuities it would mean that the older purchasers would be overcharged by a similar percentage.

Accordingly it was considered necessary to allow for improving mortality by making separate tables of rates according to ten-year groups of year of birth. These tables were arranged so that there should be no difficulty in using them in practice.

The rates are considerably lower than the rates for annuity purchases from the Dominion Government Annuities Branch or from any other source in Canada; this is due to the  $3\frac{1}{2}\%$  interest basis, despite the stringent mortality assumptions. The  $3\frac{1}{2}\%$  interest credited to depositors' accounts under the Alberta Act compares with 3% under Dominion Government Annuities,  $2\frac{3}{4}\%$  under Canadian insurance company contracts and  $2\frac{1}{4}\%$  under most United States insurance company contracts.

There is a strong case for adopting tables in this form, for the following reasons:

1. Equity between young and older purchasers is achieved. The Government is not subsidizing the young deferred annuitant at the expense of the old immediate annuitant.
2. The tables are unlikely to need amendment for many years in the future. The Dominion Government rates have been changed three times within the last fifteen years and a further amendment is likely to be needed in the fairly near future.
3. A \$10 initial deposit by an individual aged 20 guarantees for him or her in respect of any future deposits the rates in force at the time the initial deposit is made. Thus the purchaser has the option to pay in further sums many years hence to buy amounts of annuity at the rates established now. If no allowance is made for future mortality improvements this option could involve the Government in considerable losses.
4. If no allowance is made for improving mortality, losses will not be apparent in the early years but will be shown in the Annuity Reserve Account after the deferred annuitants retire. A serious deficit position might arise in the Annuity Reserve Account after the deferred annuities mature.
5. The best available information indicates that the value of annuities will rise by nearly  $2\frac{1}{2}\%$  every ten years. It would seem only prudent to take account of these facts in setting the annuity rates.

As mentioned above, the mortality basis adopted for lives born in 1890 and earlier was:

Males: *a*-1949 (*m*) Table Projected 10 Years (Jenkins and Lew)

Females: *a*-1949 (*f*) Table (Jenkins and Lew)

The improvement in mortality was allowed for by multiplying the annuity values by the following percentages for each successive ten-year birth group.

SPECIMEN TEN-YEAR PROJECTION  
FACTORS TO BE APPLIED TO CON-  
TINUOUS ANNUITY VALUES  
(LIFE ONLY)

Age	Males	Females
60.....	1.0239	1.0156
65.....	1.0246	1.0170
70.....	1.0242	1.0175
75.....	1.0218	1.0167
80.....	1.0171	1.0137

TABLE 3

CONTINUOUS ANNUITY VALUES AT 3½% INTEREST FOR LIFE ONLY

Age	Born 1890 and earlier	Born 1891-1900	Born 1901-1910	Born 1911-1920	Born 1921-1930	Born 1931-1940
<i>Males:</i>						
60.....	13.242	13.558	13.882	14.214	14.554	14.902
65.....	11.364	11.643	11.930	12.223	12.524	12.832
70.....	9.447	9.675	9.910	10.149	10.395	10.647
75.....	7.575	7.740	7.909	8.082	8.258	8.438
<i>Females:</i>						
60.....	14.748	14.978	15.212	15.449	15.690	15.935
65.....	12.750	12.966	13.187	13.411	13.639	13.871
70.....	10.669	10.856	11.046	11.239	11.436	11.636
75.....	8.593	8.737	8.883	9.031	9.182	9.335

These improvement factors will make the annuity values for males born 1911-1920 pass through the annuity values on the *a*-1949 (*m*) Table Projected 30 Years and the annuity values for females born 1921-1930 through those of the *a*-1949 (*f*) Table Projected 30 Years. Intermediate and subsequent values will, however, not be exactly in accordance with the Jenkins-Lew assumption. Since on the above projection method the annuity values increase geometrically it is felt that the basis for annuities commencing many years in the future is conservative.

The resulting annuity values on a life only basis are shown in Table 3.

## FIRST YEAR SELECTION

The Dominion Government rates for immediate annuities are on a select basis, while deferred annuity rates are calculated on an ultimate basis.

The advisability of allowing for first year selection among immediate annuity purchasers under the Alberta Act was considered. The evidence in the Jenkins-Lew paper shows that first year selection is comparatively unimportant compared with the effect on annuity values of a few years' mortality improvements. Accordingly the same annuity tables were used both for immediate and deferred annuities.

## VALUATION OF THE ANNUITY RESERVE ACCOUNT

Considering for the moment male lives, we have concluded that the *a-1949 Table Projected 10 Years* reproduces approximately the annuity values at the date of vesting for those born 1890 and earlier whose annuities are assumed to commence in 1951. It is recognised, however, that it would be more correct theoretically to use the Jenkins-Lew basis for an earlier year, and to allow for the improvement in mortality during the annuitant's lifetime. The basis adopted tends to understate the mortality in the early years of the annuity and to overstate the mortality in later years. Thus a valuation on the annuity values used in the rate basis would tend to show a surplus in early years, which would be absorbed later. This is an undesirable situation and it seems therefore that annuities on a projected basis, obtained for example by using Sternhell's Supplementary Commutation columns, should be used in the valuation.

## ALLOWANCE FOR IMPROVING MORTALITY

A number of alternative methods of allowing for improving mortality were considered.

- a) The rate of interest used in the calculation of the annuity rates might be artificially lowered from the  $3\frac{1}{2}\%$  laid down in the Act. Improving mortality at the rate assumed is roughly equivalent to a reduction in the interest rate of rather less than  $\frac{1}{4}\%$ . It is clear however that the provisions of the Act for accumulation of money at  $3\frac{1}{2}\%$  until the annuity commencement date, when the deposit and interest are converted into annuity, make it impossible to use this basis. Furthermore while this method would ensure equity between young and old purchasers, it would not allow for the differing cost of annuities purchased in different calendar years. Hence the rate tables would still require to be changed periodically.
- b) The interest profit arising from death and withdrawals of deposits might be placed in a Mortality Reserve Fund as a special reserve against improving mortality. It would not be difficult to estimate the degree of mortality im-

provement that could be compensated by the profits from deaths for purchasers at any particular age. Since the younger the purchaser the greater the prospective profit from death and also the greater the effect of improving mortality, this method, on the face of it, should be reasonably equitable between purchasers of different ages. It is found however that the reserves required for mortality improvement are much greater than could be provided from the death profits above.

The withdrawal of deposits is, of course, entirely within the volition of the purchaser. The amount of profit from this source is speculative and though it might be considerable it would be unwise to place too much reliance on the withdrawal profits as a compensating factor for mortality improvement.

In any event the proposal to use mortality and withdrawal profits as a mortality reserve is not possible under the Act as it stands. These profits are transferred to the Revenue Account to reduce the expected subsidy under the Government's policy as regards interest rates.

- c) A single mortality table might be adopted for all ages and all types of annuity (or rather one table for males and one for females). This is the method used by the Dominion Government Annuities Branch. If a broad average table were used it appears that it should be based upon the expected mortality of annuitants whose annuities commence some ten or twenty years hence.

The method has serious disadvantages. Whether the table would result in a profit or a loss to the Government would depend on the age distribution of those purchasing annuities. The older purchasers would also in effect be subsidizing the younger purchasers. Further the table would need to be reviewed and probably changed every few years. As has been mentioned, the Dominion Government Annuity Rates have required fairly frequent amendment and considerable losses have arisen in the past where the amendment has been delayed.

- d) The tables of annuities might be given by ten-year year of birth groups, on the basis as finally adopted. The main disadvantage is the large number of tables required since rates must be quoted separately for each of seven year of birth groups. Nevertheless, it has been possible to arrange the tables in a moderately compact form and it is felt that this is the best method in the circumstances.

It should be appreciated that in preparing the rate tables a solution to a practical problem was required as a matter of urgency within the framework of the Act. Time did not permit detailed research and hence some theoretical niceties had to be ignored. The interest basis of the annuities was so generous that it was not thought unreasonable to lean on the side of conservatism in the mortality basis. It remains to be seen from the actual experience in future years of the Annuity Reserve Account as shown by the periodical valuations how appropriate the mortality assumption will prove to be.

## DISCUSSION OF PRECEDING PAPER

J. GORDON FLETCHER:

One's first thought on reading this paper is, "Why does anybody want to venture into the annuity business?" The reasons in Alberta are probably political. One would think that oil royalties would soon provide surplus funds to the province, or that money could be secured by raising the interest rate of savings deposits in the provincial Treasury Offices. However, the system has been started, so let us look at its good and bad points.

On the credit side it is:

1. Flexible as to premium payments and annuity commencement date.
2. Simple. No policy form, no passbook. Interest credited at specified dates.
3. Handled through existing provincial offices.
4. Restricted as to earliest age for annuity to begin.

On the debit side:

1. There is no pressure to pay premiums regularly.
2. The purchaser gets only a handful of receipts—no document telling him what he will get for his money.
3. The opportunity to buy an option on the rates may get the records cluttered up with inactive accounts, and could be expensive in the future if  $3\frac{1}{2}\%$  should then be much above the going rate.
4. They are not likely to sell many annuities without agents. Thus there will likely be very little money available for lending to municipalities. And if agents are hired, the actual cost of money to the Province will be considerably over  $3\frac{1}{2}\%$ .
5. The prime purpose is not to encourage saving for old age, but to collect money.

These points are pretty obvious to actuaries. I don't know what advice was sought when the scheme was developed, but it looks as though the actuarial profession was ignored until after the event.

Coming now to Mr. Coward's problem, I am glad he had the courage of his convictions and used the mortality basis he did. Parenthetically, it must be gratifying to Messrs. Jenkins and Lew to see their work put to practical use. The Alberta system is at least off on the right foot with respect to mortality. Having in mind that the rate book has to be used by ordinary mortals not cursed with mathematics, I think that the ten-year age grouping is a reasonable practical device. It does, of course, produce

discontinuities at the junctions of the age groups, so that a man born in 1901 pays more than a man born in 1900, for the same maturity age. But the customer is probably unaware of the difference, and if he is aware and wants an explanation, it should not be difficult to give one.

Mr. Coward's starting point was the experience of Canadian Government Annuities for the period 1943-48. I have since prepared some figures for the two contract years from 1948 to 1950 and for the two contract years 1943 to 1945. The volume is hardly sufficient to warrant including in the discussion, but the figures, though irregular, are consistent in showing that mortality rates are still decreasing in Canada.

DORRANCE C. BRONSON:

The Society is indebted to Mr. Coward for his straightforward account of this legislation and for his lucid description of the assumptions and techniques which he adopted in helping the provincial government in establishing the necessary premium rates. He at least has gone what is probably the maximum practicable distance in injecting the element of mortality improvement into the figures. Even so, it seems to me the long-range potential is one which could break down any actuarial assumptions, regardless of their apparent degree of conservativeness at the start.

Mr. Coward cites the two main purposes of the Act as (1) making available to Alberta residents a retirement income on attractive terms and (2) raising funds to be obtainable, on loan, by municipalities. With respect to this latter purpose, others have pointed out that the Province itself is hardly in needs of funds at this time, whether to loan to municipalities or for other reasons. With respect to the first alleged purpose, while an attractive retirement income medium may exist in the Act, it is not likely that a "social purpose" will be served in effectuating purchases as a basic thrift device among the small income categories; more likely, it will be the people who are already relatively well off and "who know a good thing when they see it" that will take advantage of the amazing possibilities under the long-range options of the Act.

Mr. Coward points out that purchasers (or "option buyers") who later withdraw their deposits will lose the interest thereon, and that this reversion from interest will "to some extent" make up for the government subsidy with respect to interest for those who stay. It seems to me that one might question the "to some extent" phrase on the grounds that, with enough turnover, a pure net profit would result. Mr. Coward's paper does not explain how the article is to be marketed. The article itself provides the "carrot" and this will be enough for some people—mainly the well-to-do as mentioned above—but whether the Province is going to furnish

the "stick" as well as the carrot, the paper does not tell us. If so, however, there can well be many "good intentions" implemented by starting off on a program of savings through this medium, but as with all such voluntary—and *continuously* voluntary—arrangements, the good intentions sooner or later are apt to evaporate and people will be willing to forfeit considerable value just to "get their money back." Unfortunately, this is likely to occur among those who should conserve the inherent values so that the "profit" will come from the wrong people.

Mr. Coward points out the apparent flexibility in the Act in that after the Regulations are developed, they may admit of the use of the scheme for employee retirement plans although he points out certain limitations in that regard. He also mentions the likely possibility for one person to start off a deposit program for another, *i.e.*, a parent for a child, a husband for a wife, an employer for an employee, etc. These would apparently be subject to an immediate full vesting in the person for whom the deposit was made. One wonders, however, whether any method of control or assignment might be worked out. Consideration on this leads to the intriguing idea of setting up a business in Alberta starting options for people and following up later with the completion of maximum purchase in respect of those who then appear to have the greatest longevity ahead of them. This would not be at all a precedent since Mr. Murphy, in his very valuable paper on government annuities in 1939,<sup>1</sup> described the active business which was engendered along these lines after the adoption in England of some revised government annuity rates back in 1829.

Shrewd gentlemen of the Stock Exchange, commissioners of hospitals, and even certain life insurance associations, which were empowered to invest in life annuities, employed agents to hunt about the country, particularly in Scotland, where robust men of advanced age could be found who would permit themselves to be nominated for these annuities.

It is, perhaps, unbecoming of one below the border to imply criticism of what some Province above the border wishes to do in this field. I cannot help but relate this Act, however, to the possibility of similar proposals in the U.S. In fact, we have had from time to time proposals for the issuance of federal government annuities which, I am glad to say, have thus far been thwarted. Even at the present time, some people are seriously suggesting the conversion of our war bonds, upon maturity, into attractive life annuities, thus saving the government from having to find the immediate wherewithal to redeem them and, instead, translating them

<sup>1</sup>"Sale of Annuities by Government," Mr. R. D. Murphy, *Proceedings of the Thirty-Third Annual Convention, The Association of Life Insurance Presidents*, pp. 160-178.

into a more deferred obligation which either would entail much greater aggregate loss to the government (*i.e.*, taxpayers of the future) or could be easily digested with the medicine of inflation in the future.

Government annuities stem back into the Middle Ages. England commenced in 1808 but I understand the volume never got to be very large. The Canadian Dominion Government started 100 years later, in 1908, and developed quite a high volume of this business although, if my information is correct, it has not helped in solving a social problem in old-age protection (except to some extent in the employee benefit field) and now the Dominion premium rates are not as attractive as they were previously. It will be interesting to follow the experience of the Alberta legislation and while I do not wish it bad luck in the premises, I trust those premises remain above the border.

(AUTHOR'S REVIEW OF DISCUSSION)

LAURENCE E. COWARD:

The paper consists of two main parts: first a piece of straight reporting on the Alberta Annuities Act and the Regulations, and then a discussion of the rate basis which makes direct allowance for future improvements in mortality.

This is the first time a Provincial Government in Canada has entered the Annuity field, and both Mr. Fletcher and Mr. Bronson question the wisdom of the step. I have heard the following (not entirely consistent) objections to the sale of annuities by Governments:

1. That the sales will be insignificant
2. That the Government will lose money through the options and general inflexibility
3. That the Plan is unfair competition to the insurance companies
4. That Government should govern, and not engage in commerce
5. That the wrong people are benefited

I will only remark that in the case of Alberta, where the annuities are based on  $3\frac{1}{2}\%$  interest, it is true that the annuities are very much better bargains than are obtainable elsewhere in Canada. It is also true that the sales have been very few in the first months of operation of the Plan, since there are no agents.

The Actuaries were not asked to advise on the scheme itself but only on the rates and administrative questions. The problem was that the Act had been passed and the Government had to have some rates within a very short period of time. Moreover, nearly all the loopholes for providing reserves and building up contingencies margins had been closed in the Act.

It was clear that since the annuities were based on  $3\frac{1}{2}\%$  interest, they would be cheaper than those from any other source in Canada. Hence it was thought that the mortality basis should be conservative and that allowance should be made as far as possible for future improvements in longevity.

At this point I should like to apologize to Messrs. Jenkins and Lew for wilfully misusing their excellent tables. From a theoretical point of view my treatment of the Jenkins-Lew rates is hard to justify, but from a practical point of view I believe it is not inappropriate. The assumption that the annuity values increase in geometrical progression with calendar year of issue was adopted for convenience and it means that the actual rates of mortality are assumed to decrease down to nothing in comparatively few years. I believe, indeed, that Mr. Sternhell's projections are open to the same objection that the mortality rates become zero after about 100 years.

Two other difficulties might be mentioned. There is a limit to the size of year of birth groups that can be used, as otherwise an anomaly will arise. There would be an anomaly if the premium at age 25 in a certain year of birth group were greater than the premium at age 26 in the previous year of birth group. This situation would arise if the rate of projection per group more than balanced the rate of interest.

Furthermore, the accurate calculation of joint and last survivor annuities would involve a great volume of tables. Possibly the method of equal ages would prove sufficiently accurate, taking the year of birth group as that of the substituted equal-aged lives.

Nevertheless, as a practical instrument, tables which allow directly for mortality improvement have considerable advantage, and they appear to offer the only satisfactory solution to the problem in Alberta.