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THE FUTURE OF GROUP INSURANCE: DEMOGRAPHIC ASPECTS

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ABSTRACT

The demographic effects of the aging "baby boom" generation are soon to be felt in North American group insurance markets. This paper examines the demographic effects in terms of projected growth rates for the labour force and for several related population-base quantities. Group life cost projections are given per dollar of insurance and per employee. Relevance of the demographic projections to group insurance marketing is discussed.

I. INTRODUCTION

In the twenty years following World War II, North Americans experienced a period of rapid economic growth and prosperity. Their ensuing vision of stability triggered a rise in birth rates that quickly developed into a "baby boom." But the early sixties brought an unexpected wave of cultural evolution. Within a few years, maternity went out of style and the boom subsided into a "baby bust" [2].

Through infancy, childhood, and adolescence, the boom wave flooded Canadian and American educational facilities. The bust has nearly drained them [18]. Fifty years down the road, the wave will deluge the pension systems—and then desert them [4].

Meanwhile, the baby-boom generation has entered the labour force. It has provided a steadily growing market for employee benefits such as group, life, annuity, and health coverages. Product development has been vigorous, and competition has become a major worry for North American group actuaries. But do they anticipate the passing of the "boom"?

This paper examines the imminent demographic scenario for the benefit of insurance pricing and marketing experts who will be responsible for maintaining the competitive positions of their group products in the years to come.

II. THE POPULATION PROJECTION

The labour force is drawn from the population at large, so a first step in making labour force projections is to quantify the underlying population growth. The population projection depends upon three parameters: anticipated fertility, migration, and mortality rates.

Both Statistics Canada and the United States Department of Commerce (Bureau of the Census) have done several population projections based on a variety of assumptions with respect to each of fertility, migration, and mortality. We chose one particular projection for each country, the projection chosen being that which appeared to be "most likely." Our basic premise is that the present downward trend in family size will level off in the near future [1, 6], that immigration rates will remain level, and that mortality rates will decrease ever more slowly [8].

For our Canadian projections [12] the fertility rate starts at 1.75 births per woman (the 1976 level), with a small initial decline followed by a small increase. Net immigration is 75,000 persons per annum. Mortality starts at the 1976 experience level, declines slowly to 1986, and remains level thereafter.

For United States projections [16] the fertility rate assumption is a constant 1.7 births per woman; net immigration is 400,000 persons per annum; and mortality rates continue to decrease (by declining amounts) through the fifty-year period. The United States starting point is 1977.

Both projections are shown in Table 1.

As a gauge of prediction credibility, it is appropriate to estimate confidence intervals for the population projections. An ad hoc method based on subjective estimates of how high fertility rates and immigration rates might go (e.g., 2.1 births per woman or 100,000 immigrants) leads to the first result shown in Chart I.

A discussion with the eminent demographer Nathan Keyfitz brought to light a second and perhaps more precise method for developing the 95 percent interval. Keyfitz determined root-mean-square errors for a large number of forecasts after actual population growth data became known [7]. In particular, his studies find that in projections from base year 1958 for countries with relatively slow growth rates (under 1.8 percent per annum) the rms error averages about 0.29 percentage points. He suggests that modern forecasting techniques reduce this error by about 20 percent. Table 2 and Chart I show the 95 percent interval corresponding to 0.25 percent rms error assuming a normal distribution.

The confidence interval for the American projection is proportionately identical. For this reason, and for purposes of clarity, we have not included intervals on any of the United States charts in this report.

The Canadian projections in this paper have been adjusted for undercount so as to be consistent with historical data. This was not necessary for the United States projections. Also, the Canadian census and projection data include only civilians, whereas the United States data include members of the armed forces. It was not practical to adjust for this.

III. THE PARTICIPATION RATE PROJECTIONS

Statistics Canada defines the participation rate as "the labour force expressed as a percentage of the population aged 15 and over" [15], where the labour force includes civilian noninstitutionalized persons aged 15 and over who are employed, that is, who are "actively working or are temporarily off work because of disability, illness, family, bad weather, labour disputes, vacation, etc." [15]. The United States definition differs only in the minimum age, which is set at 16.

For a particular age, sex, or marital status group, the participation rate expresses the labour force in that group as a percentage of the population for that group. The magnitude of the labour force at any time is closely related to the size of the population, since the population both supplies the labour force and demands its services. Thus, the first step in projecting labour force figures is to project the participation rates. These rates may then be applied against the projected population.

Age/sex-specific participation rates have changed frequently over the past few decades, especially in the female categories [15]. This makes it necessary to project the rates for each age/sex cell individually and then to deduce the overall participation rates as population-weighted averages. Our projections are based upon the Canadian trends [3, 5], which match surprisingly well with the American trends [17]. Chart II summarizes each case. As a reflection of uncertainty, projections beyond 2001 were generally leveled. The projections were smoothed with a five-term Minimum-R3 M.W.A. formula and have been rounded to one decimal place (see Table 3).

Note that the projections allow very limited increases for young males, whereas young females continue to increase participation until nearly reaching the male levels. This reflects the increasingly similar employment attitudes of male and female high school students, as well as the increasing tendency for female university graduates to pursue careers and postpone motherhood.

The projections for ages 25–54 generally show a slowly declining male participation rate offset by an increasing female rate. This mirrors anticipated equal rights developments and more frequent male early retirements.

Finally, the projections beyond age 55 reflect lower retirement ages along with increasing female participation as the new wave of working women enters that group.

To compute aggregate participation rates over all age groups, these projections were averaged against the population projection weights. Table 4 shows the results as a continuation of historical figures. Note how the rates peak and ultimately begin to decline. This is a direct result of the baby-boom generation reaching old age and leaving the work force by retirement. The boom movement is so overpowering that the decline persists in spite of constant young and middle-aged participation rates!

It is interesting to estimate a 95 percent confidence interval for the aggregate Canadian rates. Reference [3] suggests a range of acceptable rates that increases quadratically (0.9 in 1990, 1.6 in 1995, and 2.5 in 2000); however, this trend soon leads to percentages in excess of 100. A more plausible range increases linearly from 0.0 in 1981 to 4.0 in 2001 and then 12.0 in 2026. The interval is centered on the projected rates (see diagram below Table 4).

IV. THE LABOUR FORCE PROJECTION

The labour force in any age/sex/year cell is calculated as the projected population in that cell multiplied by the participation rate for that cell. The tabulated results from previous sections in this way give rise to the labour force estimates shown in Table 5.

Chart III shows the labour force age distributions in three-dimensional perspective for the Canadian and United States projections. Notice how the baby-boom wave advances diagonally across each surface, losing amplitude and finally deserting the labour force in the 2020s.

Total labour force projections are shown in Table 6. A rough confidence interval for the Canadian projection is also shown. The lower bound is the product of the lower 95 percent limits (Keyfitz method) on the population over age 15 and on the participation rate projections (likewise, the upper bound). This is not the theoretically exact 95 percent interval for the product distribution; however, it is suitable as a rough guideline.

In addition to the labour force projections by number of workers, it is of interest to consider projections by number of insurance "coverage units," that is, the minimum number of insurance units required to cover all labourers without husband/wife overlaps and the like. This is essentially a family count and may be estimated as the labour force less the number of married couples in which both spouses are employed. Data on employed couples were available from Statistics Canada [10] for 1975–81 inclusive. The participation of married women can be expected to increase

at a higher rate than that of the general female population, so the extrapolation of employed married women was calculated in proportion to the number of married couples (projected by Statistics Canada [9]) modified upward by a special female participation factor. The special factor rises almost twice as quickly as the usual factor until 2000. Subsequent coverage unit levels have been estimated in proportion to the number of male labour force participants. Table 7 and Chart IV illustrate these projections and the coverage unit projections for Canada. American data were not readily available.

V. THE FATE OF GROWTH

The demographic base for group insurance products, whether regarded as the labour force or as coverage units, will continue to grow over the next few decades. However, the rates of growth have recently peaked and are beginning a steep decline that promises to continue (even on the upper 95 percent confidence limit) for the next half-century. This is illustrated in Table 8, Chart V, and Chart VI. Also shown are the corresponding growth figures for the segment of the population aged 0–65. This segment might be regarded as proportional to the number of people covered by health insurance either as employees or as dependents of employees. Again, the growth rates are declining.

The growth falloff shown in Table 8 and Chart V is purely a result of demographic circumstances and is independent of the economic situation. Apparently the aging baby-boom generation will place a significant additional strain (beyond the slow economy) on group insurance markets.

VI. AN ANOMALY

While the analysis of labour force growth is relevant to all types of group insurance, the demographic examination of group life may be taken one step further. Suppose that the life insurance covers only labour force participants. Then, by applying appropriate death rates, we can observe how total death claims will respond to the passing baby-boom generation. Furthermore, supposing that death benefits are proportional to employee salaries, we can project the death benefit costs per employee.

Predicted population death rates were available from Statistics Canada [14] in the form of 1976 and ultimate 1986 scales (see Table 9). Approximate Canadian wage scales (1978 dollars) were also available [11]. To enhance comparability, these same factors have been applied to the Canadian and American labour force projections.

Table 10 shows the aggregate death rates calculated for the Canadian and United States labour force projections. These rates might be inter-

preted as the required one-year term premiums or claim costs per $1,000 of employed life coverage, and are shown as such on Chart VII.

Table 10 also shows aggregate death benefit costs computed from the age-specific wage scales and death rates. These costs are displayed on Chart VII as the group life costs per employee, and also might be interpreted as the required term premium per employee. The charts have been scaled to a common point in 1981 (Canada) and 1980 (United States) for purposes of comparison.

Each of the graphs is J-shaped, with a curious decline affecting the first ten years. This anomaly is caused by the baby-boom generation as it leaves the high-accident-risk age group (20–35). The peak of the boom is presently at the point of highest peril, so from this year onward, aggregate death rates will decrease until the boom approaches old age. Claim costs are also temporarily affected by the accident anomaly, although steady salary increases lessen its impact. Considering that in a stationary population the death rates and claim costs would remain level over time, it is clear that age and coverage level factors will be crucial elements in future ratemaking.

Confidence limits are not shown on the preceding charts, since exact bounds are theoretically intractable and there are no simple approximations. Preliminary estimates of 95 percent intervals for the aggregate Canadian death rates are 4.34 ± 0.5 for 1986 and 4.28 ± 0.9 for 1991 (numerical simulation).

VII. THE PROSPECTS FOR GROUP INSURANCE

Group insurance serves many markets, but the largest portion of business is in employee benefits. Nearly all large employers have coverage of some form for their full-time employees. (Curiously, statistics such as the total number of insured labour force participants are not available, even from insurance organizations such as the Canadian Life and Health Insurance Association).

The declining growth rates that are projected for the labour force will affect the employee insurance market, although indirectly. For example, the decline may be offset by expansion into new markets such as group coverage for part-time employees, group legal, vision care, and (especially in the United States) group dental coverage. New incentives such as preventive medicine bonuses may revitalize old markets. Existing benefits might be enhanced by relaxing their deductible and coinsurance restrictions. Finally, the impact of major external factors such as the economy and the level of government intervention (e.g., TEFRA) into insurance could be substantial.

Marketing experts can address only the problems they foresee, so the key to retaining a competitive position depends upon the accuracy of their foresight. The projections in this paper are intended to document the magnitude of the demographic problem caused by the aging baby-boom generation.

Projections are dependent entirely upon the underlying assumptions, and assumptions are never 100 percent accurate. We have emphasized the development of confidence intervals to accommodate normal chance fluctuations, but the possibility of serious intervention by external factors exists and cannot be quantified. This paper has demonstrated that, within the realm of reasonable expectations, the demographic base for present group insurance coverages is growing ever more slowly and will level off within the next thirty years. It will take the best of wary actuarial and marketing talent to address these concerns and maintain profitability for the group insurance business.

VIII. ACKNOWLEDGMENTS

We are grateful to a number of actuaries for their valuable comments on the several drafts of this paper. Particular thanks go to Allan Brender, James Chapman, Glenn Bier, and Alexander Brown, whose advice and practical suggestions were of great assistance in bringing our presentation to its final form.

TABLE 1A

PROJECTED CANADIAN POPULATION BY AGE AND SEX

(Thousands)

Male	1981	1986	1991	1996	2001	2006	2011	2016	2021	2026
15-19	1174	994	940	1002	1053	1040	978	927	922	941
20-24	1213	1192	1014	960	1021	1073	1059	998	947	942
25-29	1099	1245	1224	1048	994	1055	1106	1092	1032	981
30-34	1017	1115	1261	1240	1064	1011	1072	1122	1109	1048
35-39	828	1021	1118	1262	1242	1068	1015	1075	1125	1112
40-44	668	825	1013	1109	1252	1231	1060	1007	1067	1116
45-49	631	656	807	993	1087	1226	1206	1039	987	1046
50-54	609	609	633	780	959	1050	1184	1164	1003	954
55-59	562	575	576	599	737	907	993	1120	1100	948
60-64	453	517	529	530	551	677	832	912	1028	1010
65+	988	1089	1214	1309	1370	1423	1565	1807	2062	2346

Female	1981	1986	1991	1996	2001	2006	2011	2016	2021	2026
15-19	1125	951	894	956	1005	992	933	884	879	898
20-24	1176	1152	978	922	983	1032	1020	960	912	907
25-29	1097	1205	1181	1008	952	1013	1062	1049	990	942
30-34	1007	1112	1219	1196	1023	967	1028	1077	1064	1006
35-39	807	1009	1113	1220	1197	1025	969	1030	1079	1066
40-44	655	804	1004	1108	1214	1191	1020	965	1025	1074
45-49	619	650	798	996	1098	1204	1181	1012	957	1016
50-54	614	612	642	787	982	1083	1187	1164	998	944
55-59	612	602	601	630	772	962	1061	1162	1140	978
60-64	511	593	585	584	612	749	932	1027	1124	1102
65+	1320	1524	1764	1937	2055	2152	2341	2664	3030	3425

Total	1981	1986	1991	1996	2001	2006	2011	2016	2021	2026
15-19	2299	1946	1834	1958	2059	2032	1911	1811	1801	1840
20-24	2389	2344	1992	1881	2004	2105	2079	1958	1859	1848
25-29	2196	2450	2406	2056	1945	2068	2168	2142	2022	1923
30-34	2024	2227	2480	2436	2088	1978	2100	2199	2173	2054
35-39	1635	2030	2231	2482	2438	2093	1984	2105	2204	2178
40-44	1323	1627	2018	2217	2466	2422	2080	1972	2092	2190
45-49	1251	1306	1605	1989	2186	2430	2387	2050	1944	2062
50-54	1223	1221	1275	1567	1942	2133	2371	2328	2001	1898
55-59	1174	1178	1177	1229	1509	1869	2054	2281	2240	1926
60-64	963	1110	1114	1113	1163	1426	1764	1939	2151	2111
65+	2309	2614	2979	3247	3425	3575	3906	4471	5092	5771

TABLE 1B

PROJECTED UNITED STATES POPULATION BY AGE AND SEX

(Thousands)

Male	1980	1985	1990	1995	2000	2005	2010	2015	2020	2025
15-19	10468	9150	8546	7896	8741	8715	8223	7639	7364	7432
20-24	10520	10317	9033	8434	7808	8631	8607	8129	7567	7303
25-29	9438	10250	10047	8795	8212	7603	8391	8367	7911	7370
30-34	8555	9575	10377	10163	8912	8330	7718	8498	8475	8019
35-39	6869	8486	9470	10247	10025	8778	8192	7572	8334	8306
40-44	5691	6888	8494	9468	10236	10019	8779	8196	7574	8332
45-49	5383	5602	6770	8340	9556	10312	10374	9302	8149	7580
50-54	5645	5313	5529	6679	7962	8910	9396	9060	8462	7864
55-59	5458	5361	5044	5248	6367	7506	8415	8817	8774	8145
60-64	4583	4985	4901	4614	4774	6103	7436	8575	9087	8429
65+	10108	11012	11999	12602	12717	12924	13978	16063	18468	20861

Female	1980	1985	1990	1995	2000	2005	2010	2015	2020	2025
15-19	10141	8857	8231	7597	8386	8368	7903	7350	7094	7168
20-24	10398	10192	8920	8294	7656	8457	8438	7977	7434	7183
25-29	9492	10331	10123	8870	8257	7632	8415	8396	7949	7417
30-34	8687	9703	10540	10326	9069	8452	7820	8605	8588	8136
35-39	7164	8788	9790	10627	10411	9140	8517	7875	8665	8647
40-44	5996	7214	8836	9836	10673	10461	9196	8573	7935	8729
45-49	5646	5924	7119	8712	9958	10761	10854	9744	8530	7933
50-54	6023	5618	5893	7079	8398	9399	9928	9599	8984	8359
55-59	5944	5761	5372	5637	6838	8034	9000	9452	9436	8784
60-64	5214	5629	5459	5093	5278	6672	8075	9307	9891	9211
65+	14819	16293	17824	18799	19105	19512	20858	23456	26634	30059

Total	1980	1985	1990	1995	2000	2005	2010	2015	2020	2025
15-19	20609	18007	16777	15493	17127	17083	16126	14989	14458	14601
20-24	20918	20509	17953	16728	15464	17088	17045	16106	15001	14486
25-29	18930	20581	20170	17665	16469	15235	16806	16763	15860	14787
30-34	17242	19278	20917	20489	17981	16782	15538	17103	17063	16155
35-39	14033	17274	19260	20874	20436	17918	16709	15447	16999	16953
40-44	11687	14102	17330	19304	20909	20480	17975	16769	15509	17061
45-49	11029	11526	13889	17052	19514	21073	21228	19046	16679	15513
50-54	11668	10931	11422	13758	16360	18309	19324	18659	17446	16223
55-59	11402	11122	10416	10885	13205	15540	17415	18269	18210	16929
60-64	9797	10614	10360	9707	10052	12775	15511	17882	18978	17640
65+	24927	27305	29823	31401	31822	32436	34836	39519	45102	50920

TABLE 2

PROJECTED CANADIAN POPULATION AND CONFIDENCE ESTIMATES

(Thousands)

Year	Expected Population	Ad Hoc 95% Interval	Annualized Growth Rate	Keyfitz Interval	Keyfitz 95% Interval
1976	22992.7	(22993, 22993)			(22993, 22993)
			1.14 %	(0.64,1.64)	
1981	24338.2	(24103, 24574)			(23738, 24941)
			1.11	(0.61,1.61)	
1986	25716.3	(25102, 26331)			(24471, 27014)
			0.96	(0.46,1.46)	
1991	26974.6	(25857, 28092)			(25039, 29045)
			0.74	(0.24,1.24)	
1996	27992.7	(26343, 29642)			(25341, 30891)
			0.57	(0.07,1.07)	
2001	28793.5	(26606, 30981)			(25430, 32579)
			0.46	(-0.04,0.96)	
2006	29467.9	(26678, 32258)			(25379, 34360)
			0.40	(-0.10,0.90)	
2011	30067.6	(26565, 33570)			(25252, 35934)
			0.32	(-0.18,0.82)	
2016	30556.6	(26242, 34871)			(25026, 37432)
			0.21	(-0.29,0.71)	
2021	30876.4	(25702, 36051)			(24665, 38780)
			0.08	(-0.42,0.58)	
2026	30996.7	(24946, 37048)			(24151, 39918)

CHART I

PROJECTED CANADIAN POPULATION WITH 95 PERCENT CONFIDENCE INTERVALS

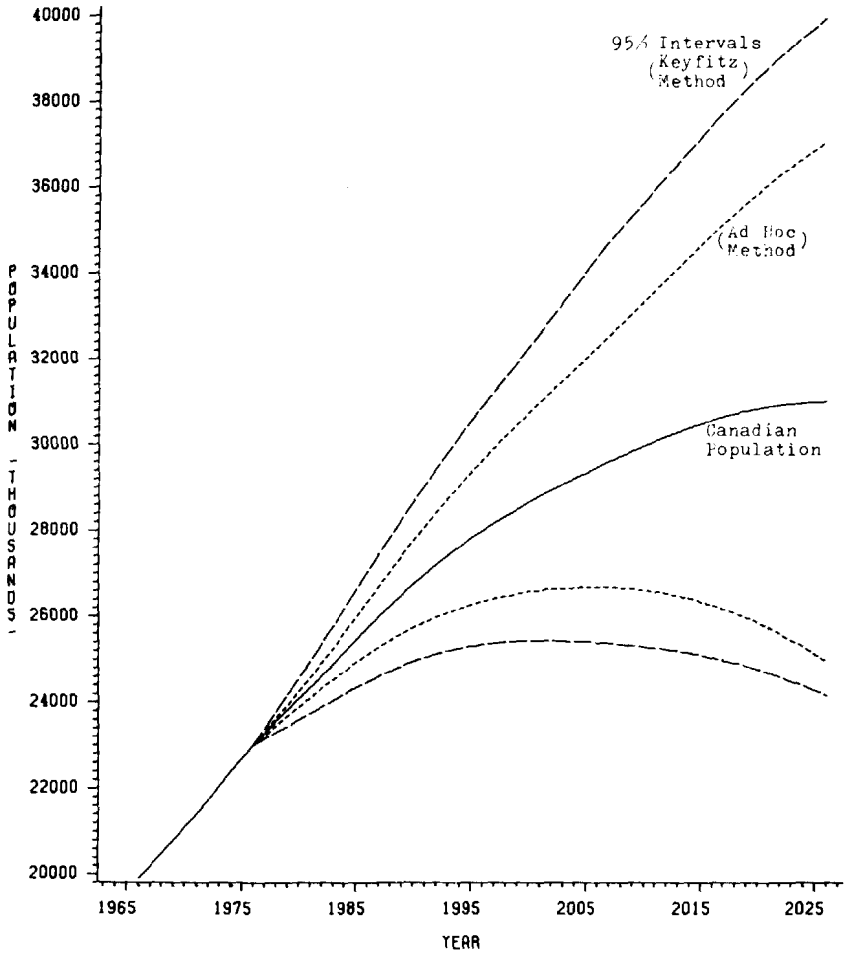
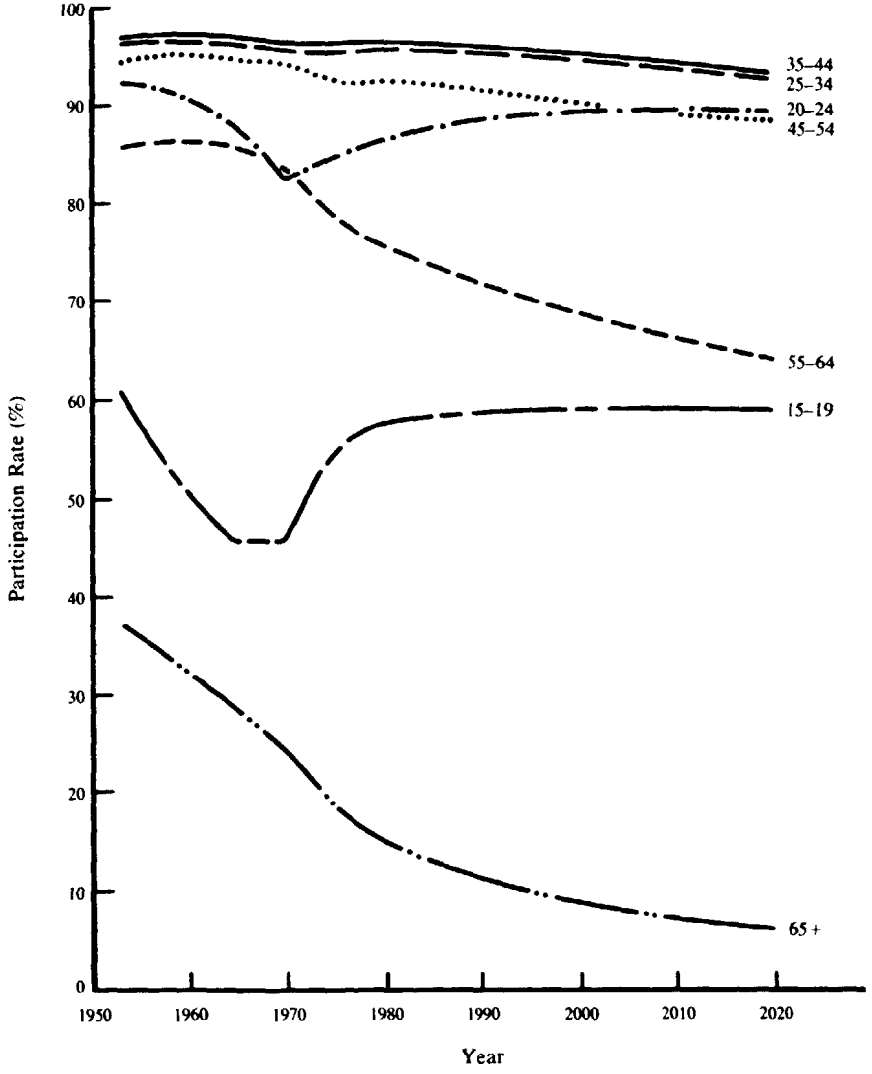


CHART IIA

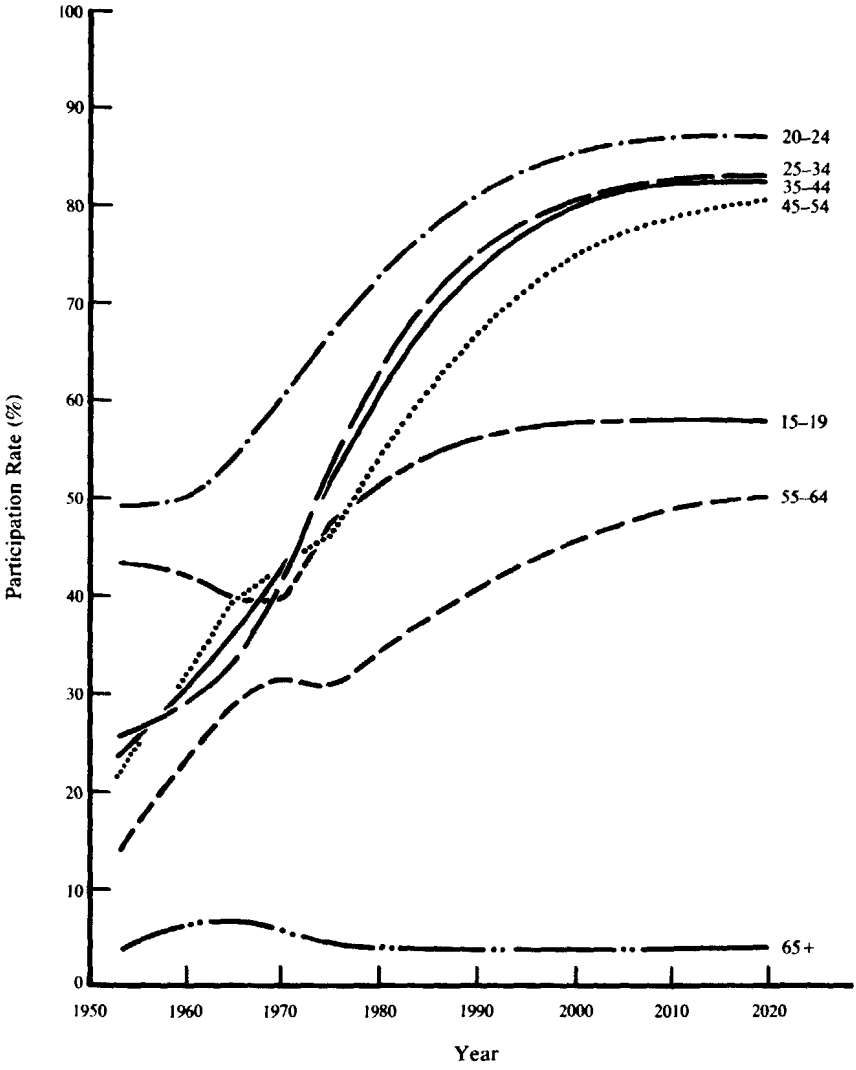
LABOUR FORCE PARTICIPATION RATES BY AGE GROUP—MALES*



* Historical data source: [9].

CHART IIB

LABOUR FORCE PARTICIPATION RATES BY AGE GROUP—FEMALES*



* Historical data source: [9].

TABLE 3

PROJECTED PARTICIPATION RATES

(Percent)

Male	1981	1986	1991	1996	2001	2006	2011	2016	2021	2026
15-19	57.4	58.0	58.2	58.4	58.5	58.5	58.5	58.5	58.5	58.5
20-24	86.9	87.9	88.8	89.5	89.9	90.0	90.0	90.0	90.0	90.0
25-34	95.9	95.6	95.3	95.1	94.8	94.3	93.7	93.1	92.5	92.0
35-44	95.5	95.3	95.0	94.5	94.0	93.5	93.1	92.6	92.1	91.7
45-54	92.4	92.1	91.6	91.1	90.6	90.1	89.5	88.9	88.3	87.7
55-64	75.1	73.3	71.6	70.0	68.4	67.1	66.0	65.0	64.0	63.0
65+	14.6	13.0	11.5	10.1	9.0	8.0	7.3	6.7	6.2	6.0

Female	1981	1986	1991	1996	2001	2006	2011	2016	2021	2026
15-19	52.7	54.4	56.0	57.0	57.5	57.5	57.5	57.5	57.5	57.5
20-24	74.7	77.8	81.1	83.7	85.1	86.0	86.6	86.9	87.0	87.0
25-34	65.0	70.6	75.2	78.1	79.9	81.1	82.0	82.4	82.5	82.5
35-44	63.4	68.8	73.6	77.1	79.7	81.3	82.0	82.1	82.0	82.0
45-54	56.3	61.9	67.6	72.0	74.7	76.6	78.0	79.2	80.0	80.0
55-64	35.8	38.5	41.4	44.0	46.1	47.8	48.9	49.6	50.0	50.0
65+	4.1	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0

TABLE 4

HISTORICAL AND PROJECTED PARTICIPATION RATES

Year	MALE Can.	MALE U.S.	FEMALE Can.	FEMALE U.S.	Combined Canada	Estimated 95% Confidence Interval
1966	79.8	81.4	35.4	40.3	57.3	-
1971	77.3	80.0	39.4	43.4	58.1	-
1976	77.6	78.1	45.2	47.4	61.1	-
1981	78.3		51.6		64.7	-
1986	78.7		54.8		66.6	(66.1, 67.1)
1991	78.3		57.4		67.7	(66.7, 68.7)
1996	77.5		59.3		68.2	(66.7, 69.7)
2001	76.7		60.4		68.4	(66.4, 70.4)
2006	75.7		60.8		68.0	(65.2, 70.8)
2011	74.2		60.3		67.1	(63.5, 70.7)
2016	72.0		58.9		65.2	(60.8, 69.6)
2021	69.8		57.1		63.2	(58.0, 68.4)
2026	67.8		55.5		61.4	(55.4, 67.0)

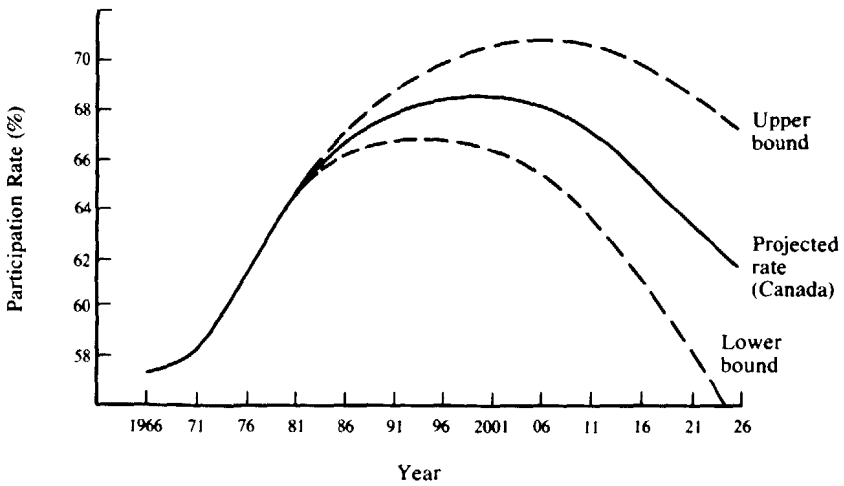


TABLE 5A

CANADA—PROJECTED LABOUR FORCE BY AGE AND SEX

(Thousands)

Male	1981	1986	1991	1996	2001	2006	2011	2016	2021	2026
15-19	658	563	534	572	602	594	559	530	527	538
20-24	1030	1024	880	839	897	943	931	877	833	828
25-29	1029	1163	1140	973	920	972	1012	994	932	882
30-34	953	1041	1174	1152	986	931	981	1021	1002	942
35-39	772	950	1037	1165	1140	975	923	972	1012	996
40-44	624	766	941	1024	1149	1125	964	911	960	1000
45-49	570	590	722	884	962	1080	1055	902	852	896
50-54	550	548	567	694	849	924	1036	1011	865	817
55-59	413	412	403	410	493	594	640	711	688	584
60-64	332	370	370	362	368	444	537	579	643	621
65+	141	138	136	129	121	111	112	118	125	138

Female	1981	1986	1991	1996	2001	2006	2011	2016	2021	2026
15-19	579	506	489	532	565	558	524	497	494	505
20-24	860	876	775	754	817	867	863	816	775	771
25-29	697	831	868	769	743	803	851	845	798	759
30-34	639	767	896	912	799	766	824	867	858	810
35-39	500	678	800	919	932	814	776	826	864	854
40-44	406	540	722	835	945	946	818	774	821	860
45-49	341	393	527	700	802	901	900	783	748	794
50-54	338	370	424	554	717	811	904	901	780	738
55-59	214	227	243	271	348	449	507	563	557	478
60-64	179	223	237	251	276	350	445	498	549	538
65+	53	60	69	76	80	84	92	104	118	134

Total	1981	1986	1991	1996	2001	2006	2011	2016	2021	2026
15-19	1226	1067	1024	1104	1167	1152	1083	1027	1021	1043
20-24	1870	1897	1656	1594	1714	1811	1794	1693	1608	1599
25-29	1711	1993	2009	1743	1663	1776	1864	1838	1731	1641
30-34	1579	1807	2071	2064	1785	1698	1805	1888	1860	1753
35-39	1262	1628	1840	2084	2071	1791	1699	1797	1877	1850
40-44	1021	1306	1665	1858	2094	2072	1781	1684	1781	1860
45-49	903	981	1249	1586	1763	1979	1954	1684	1600	1691
50-54	880	916	991	1249	1565	1734	1940	1911	1646	1555
55-59	622	638	647	681	840	1044	1147	1274	1245	1061
60-64	507	593	607	613	644	794	982	1077	1192	1160
65+	193	198	205	205	201	195	203	222	243	271

TABLE 5B

UNITED STATES—PROJECTED LABOUR FORCE BY AGE AND SEX

(Thousands)

Male	1980	1985	1990	1995	2000	2005	2010	2015	2020	2025
15-19	6009	5307	4974	4611	5114	5098	4810	4469	4308	4348
20-24	9142	9069	8021	7548	7019	7768	7746	7316	6810	6573
25-29	9051	9799	9575	8364	7785	7170	7862	7790	7318	6780
30-34	8204	9154	9889	9665	8449	7855	7232	7912	7839	7376
35-39	6560	8087	8996	9683	9424	8207	7627	7012	7676	7617
40-44	5435	6564	8069	8947	9622	9368	8173	7590	6976	7640
45-49	4974	5159	6201	7598	8658	9291	9285	8270	7196	6648
50-54	5216	4893	5065	6085	7214	8028	8409	8054	7472	6897
55-59	4099	3930	3612	3674	4355	5036	5554	5731	5615	5131
60-64	3442	3654	3509	3230	3265	4095	4908	5574	5816	5310
65+	1476	1432	1380	1273	1144	1034	1020	1076	1145	1252

Female	1980	1985	1990	1995	2000	2005	2010	2015	2020	2025
15-19	5344	4818	4609	4330	4822	4812	4544	4226	4079	4122
20-24	7767	7929	7234	6942	6515	7273	7307	6932	6468	6249
25-29	6170	7294	7612	6928	6597	6190	6900	6918	6558	6119
30-34	5647	6850	7926	8065	7246	6855	6412	7090	7085	6712
35-39	4542	6046	7205	8193	8298	7431	6984	6465	7105	7090
40-44	3802	4963	6503	7584	8506	8505	7541	7038	6507	7158
45-49	3179	3667	4812	6273	7439	8243	8466	7717	6824	6346
50-54	3391	3478	3984	5097	6273	7200	7744	7602	7187	6687
55-59	2128	2218	2224	2480	3152	3840	4401	4688	4718	4392
60-64	1867	2167	2260	2241	2433	3189	3949	4616	4946	4606
65+	608	652	713	752	764	780	834	938	1065	1202

Total	1980	1985	1990	1995	2000	2005	2010	2015	2020	2025
15-19	11353	10125	9583	8942	9936	9910	9355	8695	8387	8470
20-24	16909	16998	15255	14490	13535	15041	15054	14248	13278	12822
25-29	15221	17093	17187	15292	14382	13359	14763	14708	13876	12899
30-34	13851	16004	17815	17730	15695	14710	13644	15002	14924	14090
35-39	11102	14133	16202	17877	17721	15638	14611	13477	14781	14707
40-44	9236	11528	14573	16531	18128	17873	15714	14628	13482	14798
45-49	8153	8826	11014	13870	16096	17534	17751	15987	14020	12994
50-54	8607	8371	9048	11182	13487	15228	16153	15658	14659	13584
55-59	6227	6148	5836	6154	7507	8877	9955	10419	10333	9523
60-64	5308	5821	5769	5471	5699	7284	8856	10190	10761	9916
65+	2083	2083	2093	2025	1909	1814	1855	2014	2210	1454

CHART IIIA

PROJECTED LABOUR FORCE—CANADA

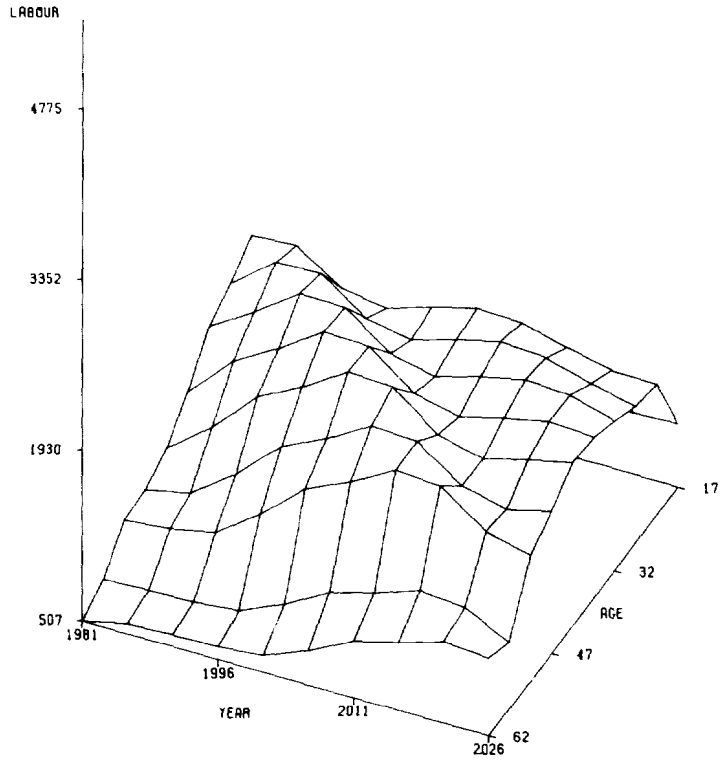


CHART IIIB

PROJECTED LABOUR FORCE—UNITED STATES

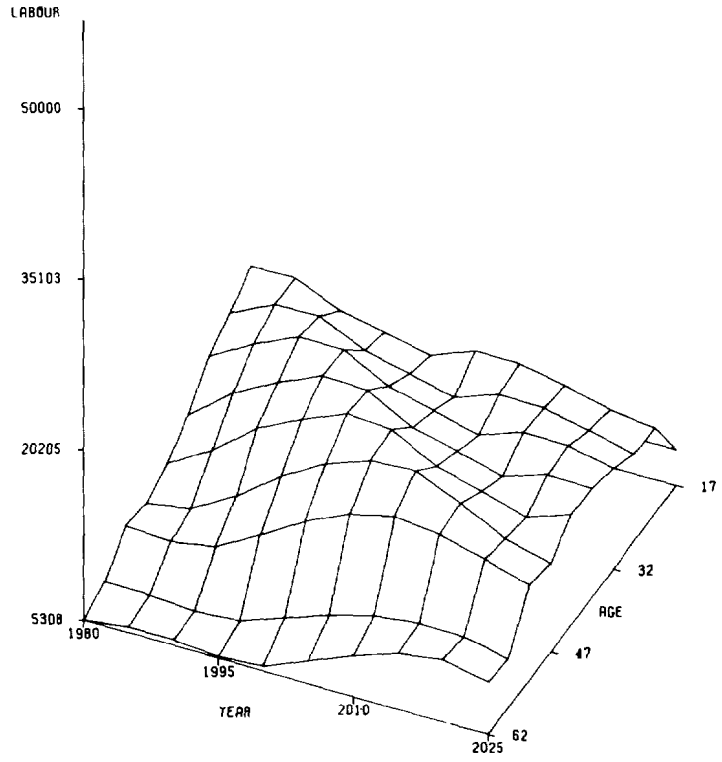


TABLE 6

HISTORICAL AND PROJECTED LABOUR FORCE

(Thousands)

	CANADA				U.S.		
Year	Male	Female	Total	95% Interval	Male	Female	Total
1951	4032	1200	5232	-	45446	18412	63858
1956	4386	1408	5794	-	47488	20584	68072
1961	4685	1825	6510	-	48870	23272	72142
1966	5124	2326	7450	-	50946	26232	77178
1971	5681	2968	8649	-	54343	31560	85903
1976	6449	3859	10308	-	57706	37087	94793
1981	7019	4811	11830	-	63607	44443	108050
1986	7568	5469	13037	(12510, 13340)	67048	50082	117130
1991	7905	6050	13955	(12910, 14680)	69291	55084	124375
1996	8205	6573	14778	(13070, 15840)	70678	58884	129562
2001	8488	7023	15511	(13060, 16880)	72048	62046	134094
2006	8694	7348	16043	(12790, 17800)	72951	64317	137267
2011	8749	7503	16252	(12400, 18590)	72627	65083	137710
2016	8627	7472	16099	(11760, 19070)	70792	64233	135026
2021	8439	7362	15801	(11060, 19410)	68170	62542	130712
2026	8242	7241	15483	(10340, 19580)	65573	60684	126258

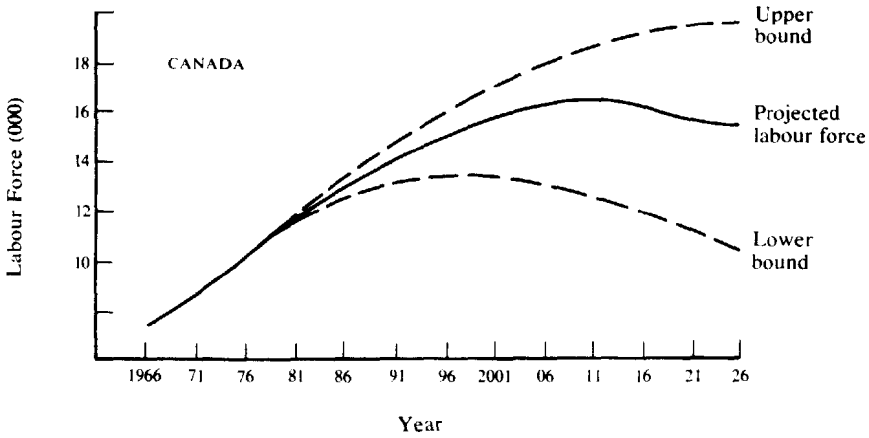


TABLE 7

HISTORICAL AND PROJECTED COVERAGE UNITS FOR GROUP INSURANCE (CANADA)

(Thousands)

Year	-- Labour Force -- Male	Female	Working Husband and Wife	Coverage Units
1975	-	-	1764	-
1976	6369	3837	1836	8370
1977	-	-	1898	-
1978	-	-	2016	-
1979	-	-	2132	-
1980	-	-	2243	-
1981	7019	4811	2356	9474
1986	7568	5469	2943	10094
1991	7905	6050	3317	10638
1996	8205	6573	3568	11210
2001	8488	7023	3797	11714
2006	8694	7348	3913	12130
2011	8749	7503	3937	12315
2016	8627	7472	3882	12217
2021	8439	7362	3797	12004
2026	8242	7241	3713	11770

CHART IV

HISTORICAL AND PROJECTED COVERAGE UNITS—CANADA

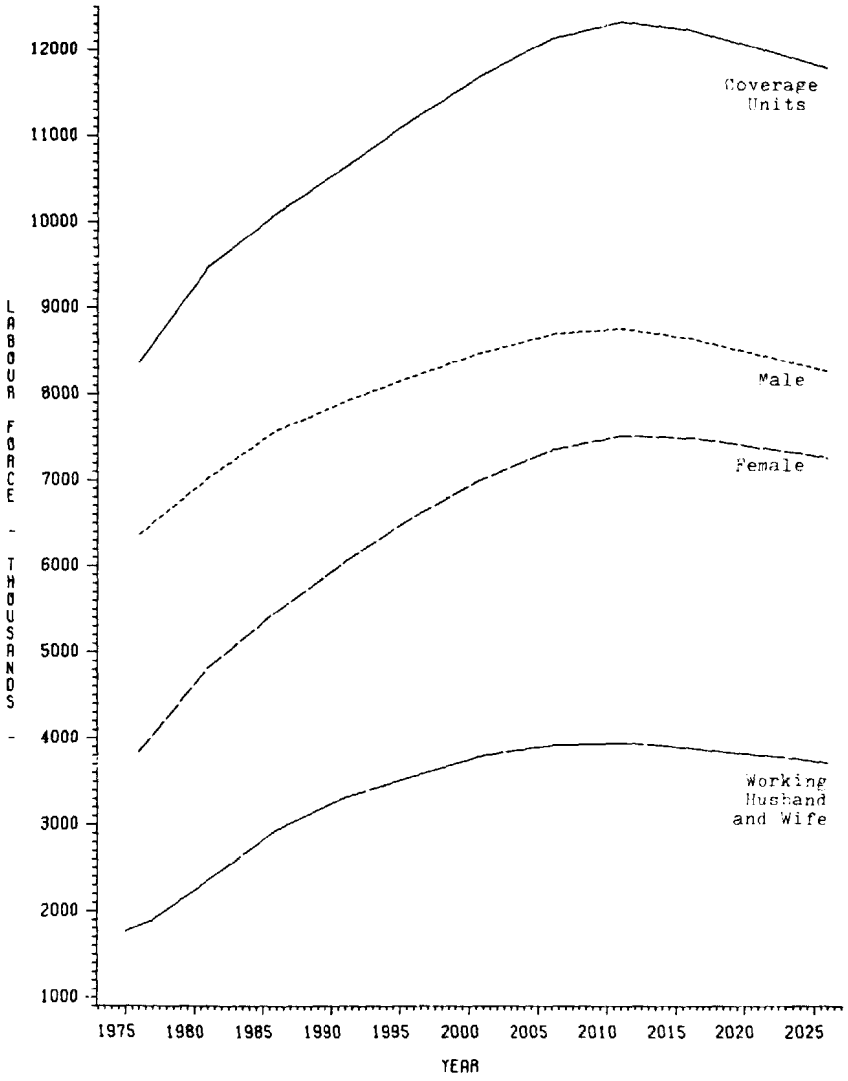


TABLE 8A

INSURANCE BASE QUANTITY GROWTH—CANADA

(From 1981; Index = 100)

	Claims -- Population --		Labour ------ Force ------		Coverage ------ Units ------	
Year	Index	Annualized Growth	Index	Annualized Growth	Index	Annualized Growth
1951	58.7		44.2		-	
		2.80 %		2.06 %		-
1956	67.4		49.0		-	
		2.57		2.36		-
1961	76.47		55.0		-	
		1.86		2.73		-
1966	83.9		63.0		-	
		1.42		3.03		-
1971	90.0		73.1		-	
		1.13		3.57		-
1976	95.2		87.1		88.3	
		0.99		2.99		2.52
1981	100.0		100.0		100.0	
		0.96		1.96		1.27
1986	104.7		110.2		106.5	
		0.76		1.38		1.07
1991	108.9		118.0		112.3	
		0.62		1.14		1.05
1996	112.3		124.9		118.3	
		0.50		0.97		0.88
2001	115.2		131.1		123.6	
		0.41		0.68		0.70
2006	117.5		135.6		128.0	
		0.21		0.26		0.31
2011	118.8		137.4		130.0	
		-0.06		-0.19		-0.15
2016	118.4		136.1		129.0	
		-0.23		-0.37		-0.36
2021	117.0		133.6		126.7	
		-0.44		-0.41		-0.40
2026	114.5		130.9		124.2	

TABLE 8B

INSURANCE BASE QUANTITY GROWTH—UNITED STATES

(From 1980; Index = 100)

Year	-- Claims Population - Index	Annualized Growth	--- Labour Force --- Index	Annualized Growth
1950	-		59.1	
		-		1.29 %
1955	-		63.0	
		-		1.15
1960	83.8		66.8	
				1.36
1965		1.20 %	71.4	
				2.17
1970	94.4		79.5	
		0.67		1.99
1975	97.6		87.7	
		0.48		2.65
1980	100.0		100.0	
		0.58		1.63
1985	102.9		108.4	
		0.48		1.21
1990	105.4		115.1	
		0.40		0.82
1995	107.6		119.9	
		0.42		0.69
2000	109.3		124.1	
		0.10		0.47
2005	110.4		127.0	
		-0.01		0.06
2010	110.3		127.5	
		-0.28		-0.39
2015	108.8		125.0	
		-0.48		-0.65
2020	106.2		121.0	
		-0.67		-0.69
2025	102.7		116.9	

CHART VA

GROWTH PROSPECTS: INSURANCE BASE QUANTITIES—CANADA

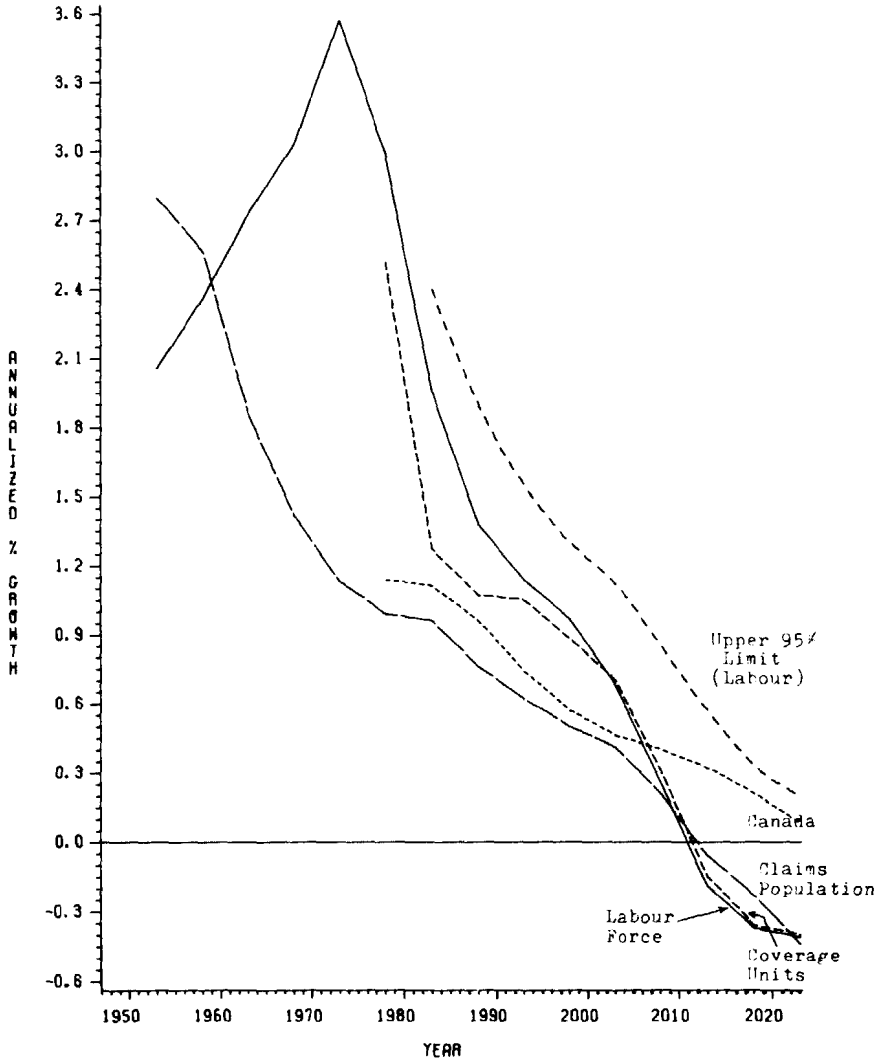


CHART VB

GROWTH PROSPECTS: INSURANCE BASE QUANTITIES—UNITED STATES

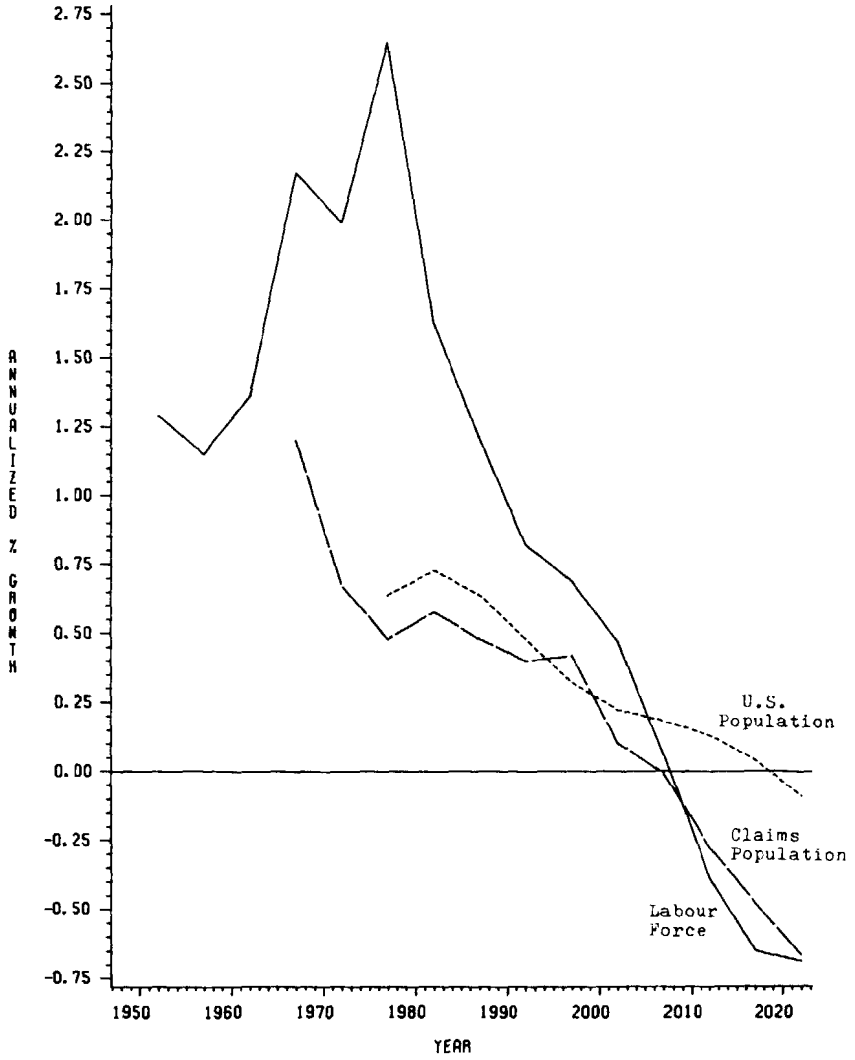


CHART VIA

INSURANCE BASE QUANTITIES: PROJECTIONS RELATIVE TO 1981—CANADA

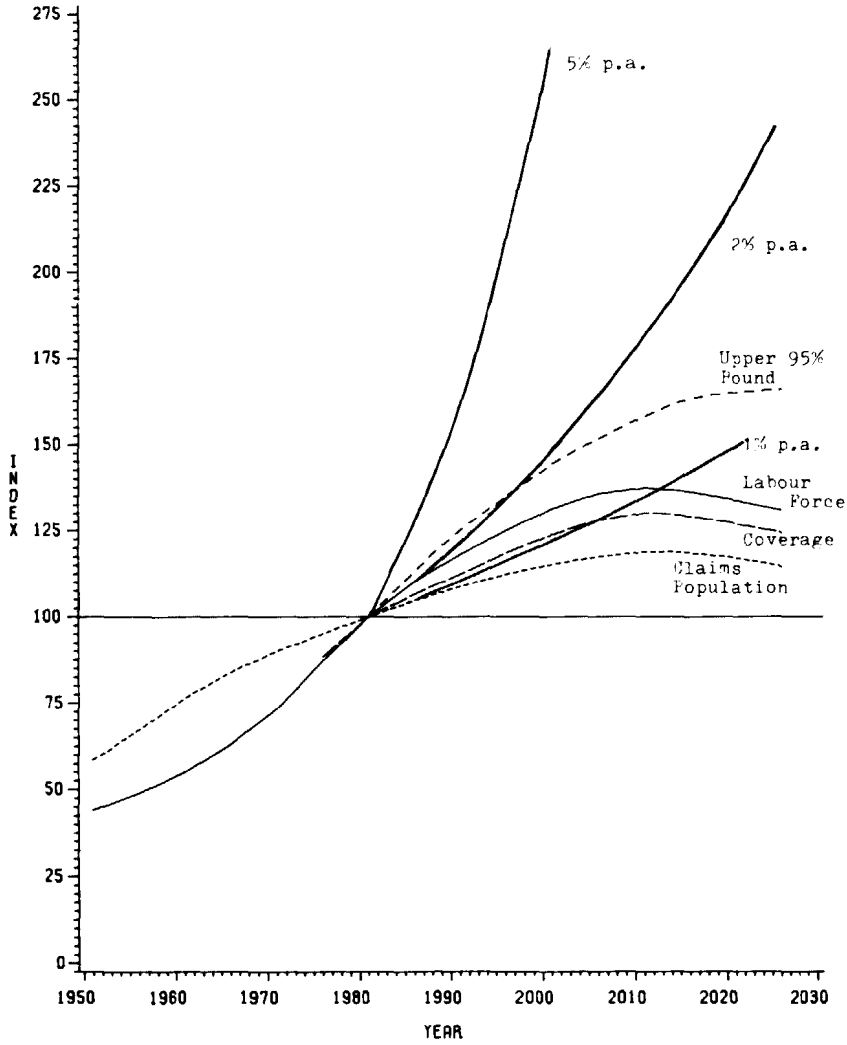


CHART VIB

INSURANCE BASE QUANTITIES: PROJECTIONS RELATIVE TO 1980—UNITED STATES

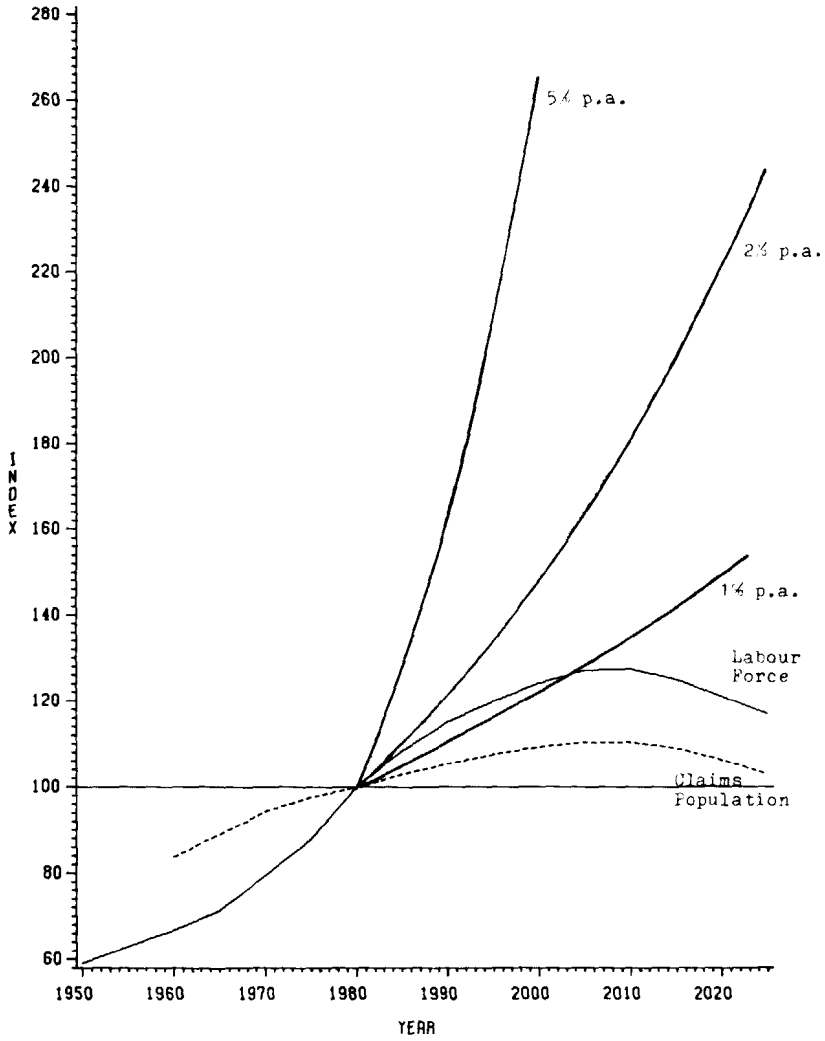


TABLE 9

PROJECTED LABOUR FORCE DEATHS

Death Rates (1000 x q_x)

Male	1976	1981	1986+
15-19	1.23565	1.22681	1.21797
20-24	1.99134	1.98961	1.98788
25-29	1.58208	1.56946	1.55685
30-34	1.62568	1.60566	1.58563
35-39	2.23132	2.22414	2.21695
40-44	3.54100	3.45729	3.40461
45-49	5.66366	5.64928	5.63491
50-54	9.29407	9.26212	9.23018
55-59	14.85570	14.77410	14.69249
60-64	23.21199	23.21199	23.21199
65+	72.30932	72.30910	72.30887

Female	1976	1981	1986+
15-19	0.5051	0.4899	0.47470
20-24	0.55930	0.54265	0.52600
25-29	0.59340	0.56445	0.53550
30-34	0.75870	0.71690	0.67510
35-39	1.22720	1.17885	1.13050
40-44	1.85090	1.75975	1.66860
45-49	3.00600	2.88870	2.77140
50-54	4.59760	4.44060	4.28360
55-59	6.96030	6.66385	6.36740
60-64	10.49330	9.88015	9.26700
65+	55.86033	54.70916	53.55799

Total Labour Deaths (NOT in Thousands)	Year	Male	Female	Total
Canada	1976	39020	9484	48504
	1981	42183	11467	53649
	1986	43934	12702	56637
	1991	45219	14536	59756
	1996	46937	16531	63469
	2001	49713	18629	68342
	2006	53281	20742	74022
	2011	56437	22580	79018
	2016	57681	23727	81408
	2021	57686	24382	82069
	2026	56314	24563	80877
U.S.	1975	424542	109283	533824
	1980	409893	116512	526405
	1985	414847	124274	539121
	1990	415993	138111	554104
	1995	420851	152830	573681
	2000	437256	168752	606008
	2005	465625	186137	651762
	2010	488943	200436	689379
	2015	489385	210029	708414
	2020	493179	215154	708333
	2025	473795	214288	688083

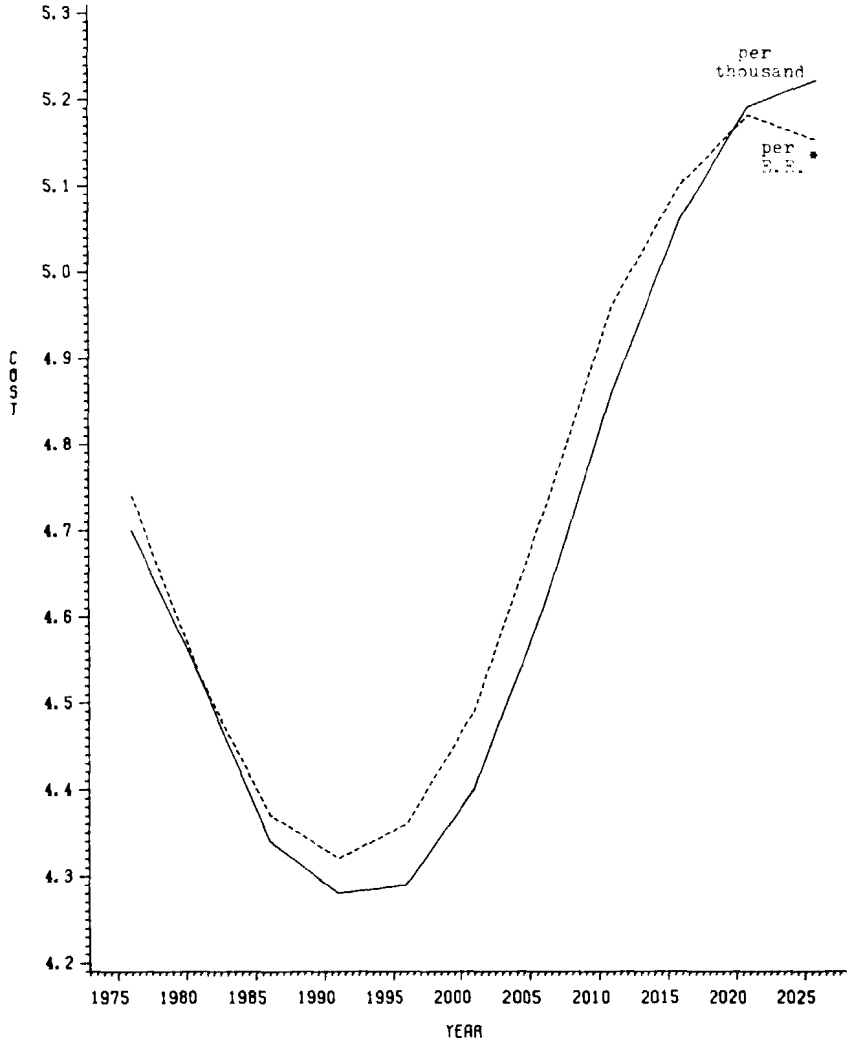
TABLE 10

GROUP LIFE COST PROJECTIONS

Year	LABOUR FORCE: Aggregate Death Rate (x 1000)	Index	Death Benefit Cost per EE (Salary $)	Index
(Canada)				
1976	4.70	103.8	61.57	104.6
1981	4.54	100.0	58.85	100.0
1986	4.34	95.8	56.69	96.3
1991	4.28	94.4	56.01	95.2
1996	4.29	94.7	56.53	96.1
2001	4.41	97.2	58.32	99.1
2006	4.61	101.7	61.23	104.0
2011	4.86	107.2	64.31	109.3
2016	5.06	111.5	66.21	112.5
2021	5.19	114.5	67.24	114.3
2026	5.22	115.2	66.80	113.5
(U.S.)				
1975	5.36	110.0	71.88	115.35
1980	4.87	100.0	62.32	100.0
1985	4.60	94.5	59.09	94.8
1990	4.45	91.4	57.36	92.0
1995	4.43	90.9	57.54	92.3
2000	4.52	92.8	59.29	95.1
2005	4.75	97.5	62.55	100.4
2010	5.01	102.8	65.74	105.5
2015	5.25	107.7	68.14	109.3
2020	5.42	111.2	69.45	111.4
2025	5.45	111.9	68.78	110.4

CHART VIIA

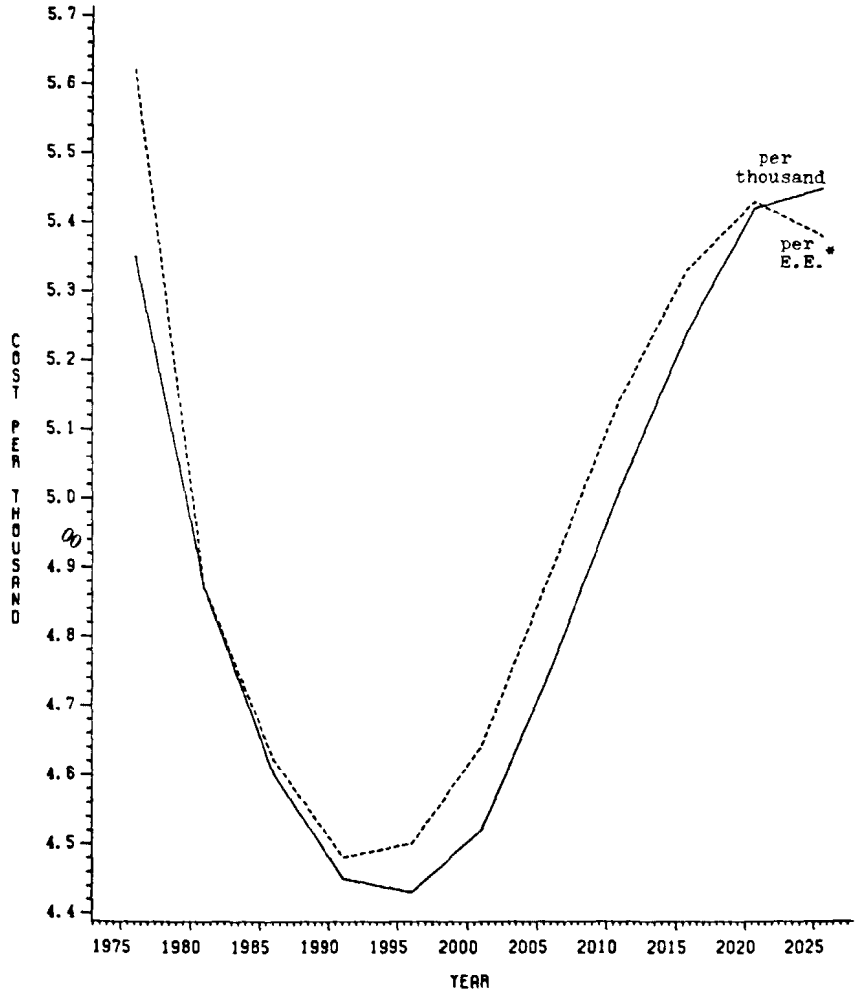
GROUP LIFE COST PROJECTIONS PER $1,000 OF LIFE INSURANCE AND PER EMPLOYEE—CANADA



* Cost per E.E. (i.e., death rate) reduced to common point in 1981.

CHART VIIB

GROUP LIFE COST PROJECTIONS PER $1,000 OF LIFE INSURANCE AND PER EMPLOYEE—UNITED STATES



* Cost per E.E. (i.e., death rate) reduced to common point in 1980.

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DISCUSSION OF PRECEDING PAPER

FRANCISCO R. BAYO AND RONALD V. GRESCH:

We thank Messrs. Brown and Lutek for presenting their paper. They point out clearly that the long-term planning of group insurance needs thorough consideration of the nation's demographic projections. We would like to emphasize that this need is not limited to group insurance planning, but extends to essentially all long-term planning.

A large part of actuarial work has to do with people, their behavior, and their interrelationships. It is only natural that actuaries should first take stock of the number of people, their age, sex, and other relevant characteristics. For short-term projections of the activities of people (insurance coverage, purchases of new automobiles, of housing, savings rates, and so on), we may limit the analysis and, as a first approximation, assume a continuation of the most recent population structure. However, long-term projections of those activities demand a detailed quantification of how that structure could change in the future and of how the changes would affect those activities.

Actuaries devote a great deal of effort to establishing economic projections, such as interest rates and salary scales; however, we suggest that more effort should be spent in the population analysis. The demographic assumptions should be regarded as the initial step in most cost estimation methods and may play a significant role in determining many of the other assumptions.

As a population group ages there is a change in its demand for insurance products as well as for other goods and services. The mix of insurance products must adapt to the people's needs and desires which in turn are affected by such factors as education, income, the ability to save, family structure, age, health, investment return, and the price and availability of other goods and services. The significance of insurance products to a specific cohort vary through its lifespan, and the insurance industry must develop and market those products which most nearly meet the consumer's needs. Because of the nature of their work, a large number of actuaries are essentially futurists, and they need to take the future demographic structure of our nation into account more fully in their analysis.

The paper refers to group insurance and makes use of the projected labor force. This labor force is viewed as a composite of the population and of the labor force participation rates. At present, our knowledge of how these two elements interrelate or interact is limited. The authors assume them to

be independent. At the Social Security Administration, we project population first and then we project the labor force participation rates. The latter rates are assumed to be, to some extent, dependent on the demographic projections.

Among the factors considered in developing the labor force participation rates are the state of the economy, marital status, disability, the presence of children in families, and, for older workers, the availability and level of retirement benefits. At the Social Security Administration we compare, for each age group and sex separately, the trend in the labor force participation rate with the trend in each of these factors, and we use the results to project future labor force participation rates. It should be noted that in determining the long-range growth in the labor force numbers, demographics play a larger role than economics.

One part of the paper does disturb us. This is related to the so-called "95 percent interval." It appears that the authors are trying to create a notion that has an appeal similar to that of the concept of "confidence interval" in statistics. But, in this subject of population projections, the available knowledge about the future is so poor that no one even knows what the average is. We dispute the authors' presentation of "95 percent intervals" which creates the impression that the whole distribution is known.

We believe that the best that can be done is to prepare various sets of projections and to clearly state to the readers that a great deal of judgement went into them. Some of the projections may be considered intermediate (or best guesses), others may be considered high, while others may be considered low. Any kind of probability statement that may be attached to any of the projections should be clearly and specifically labeled "subjective."

In the Office of the Actuary of the Social Security Administration, we prepare projections of the population as part of the annual projections of the future operations of the social security system. We also prepare projections of the labor force participation rates and of the work force. These are prepared based on a series of alternative demographic and economic assumptions and are broken down by age, sex, and some other characteristics. A portion of these are published in our Actuarial Studies and Actuarial Notes and others are available on request. Members may call or write to us for copies of these materials.

(AUTHORS' REVIEW OF DISCUSSION)

ROBERT L. BROWN AND BEN W. LUTEK:

The discussants have raised a number of interesting points to which we add the following comments.

First, we agree that participation rates are correlated over time with many factors, including population growth. The most important conclusion of our paper is that group insurance markets will feel the impact of demographic changes in the very near future, and that this impact will likely continue beyond that. As the discussants note, independence is not an unreasonable assumption in the short horizon.

Second, we maintain that there is value in describing projections with an expected value and a measure of uncertainty such as a 95 percent confidence interval. If the observed data and auxiliary assumptions are not good enough to determine a mean then mathematical projections have little value. However, if the data are good enough to determine a mean, then they also determine a standard deviation. The reader who does not wish to assume a normal distribution of possible outcomes may simply regard the intervals in our paper as being proportional to the estimated standard deviations of the forecasts.

Finally, we would like to note the impact of our labor force projections on future group health insurance costs. Taking the 1964-65 Society of Actuaries' experience as a conservative estimate of the increase in health costs with age, the aggregate cost can be expected to increase at least 20 percent (Canada) and 16 percent (United States) in the next ten years due to demographic considerations alone. This additional preinflation expense for health insurance far outweighs the 5-8 percent gain predicted for life insurance in the same period (see section VI of paper). Under the assumptions of our paper the table below shows the projection results.

TABLE

GROUP HEALTH COST PROJECTIONS

CANADA		U.S.	
Year	Index	Year	Index
1981	100.0	1980	100.0
1986	110.6	1985	108.5
1991	120.5	1990	116.7
1996	130.8	1995	124.5
2001	140.6	2000	132.3
2006	148.6	2005	138.8
2011	152.9	2010	141.6
2016	152.8	2015	140.3
2021	150.7	2020	136.5
2026	147.4	2025	131.5