The aging of the North American population and the increased willingness of insurers to consider the elderly provide the background for this selective review.

That the elderly are the focus of increasing attention is evidenced by efforts such as the Surgeon General's Workshop on Health Promotion and Aging and the Canadian Medical Association Committee report on Health Care for the Elderly. Additionally, medical school curricula, residency training programs, specialized geriatrics institutes and insurance industry sponsorship of geriatrics fellowships all reflect interest in the elderly.

In October 1988, the U.S. Department of Health and Human Services approved the creation of the Center for Chronic Disease Prevention and Health Promotion (CCDPHP) at the Centers for Disease Control (CDC). The new center was established in the belief that more emphasis was needed on chronic disease prevention if CDC was to accomplish its mission of preventing unnecessary illness, disability, and death.

Ten preventable chronic diseases that take the greatest toll in American lives and quality of life were identified. These are coronary heart disease, chronic obstructive lung disease, cerebrovascular disease, diabetes, lung cancer, cirrhosis/alcoholism, breast cancer, colorectal cancer, chronic musculoskeletal disease (including arthritis, osteoporosis, and low back pain), and cervical cancer.

Will this major commitment on Health Promotion and Disease Prevention significantly impact those lifestyle habits and have a major influence on the medical underwriting of elderly applicants?

In humans, the "specific age" is the theoretical upper maximum limit of life span and is about 110 to 120 years of age. As improvements in hygiene and eradication of certain diseases has occurred, human life expectancy has progressed towards this "specific age". Expectation of longevity in the U.S. in 1986 was 72 years for males and 78.8 years for females. In Canada, the numbers were 73 years for males and 80 years for females.

Aging is a normal process that leads to a slowing in physiologic adaptation. The consequences of this are decreased ability to cope with stress of disease or trauma.

Disability and mortality are intimately linked in the elderly and are the result of declining physical and mental health and social circumstances.

In Canada, 39% of people 65 years and older experience one or more long term disability. Many of these functional disabilities are the result of chronic diseases. The risks associated with chronic diseases are highly correlated with lifestyle habits such as smoking, lack of exercise, poor nutrition, excess alcohol intake and drinking and driving as well as socioeconomic and cultural factors.

Technologically oriented medical treatment is said to reduce premature morbidity and mortality by no more than 10 to 15%, whilst better control of lifestyle habits may prevent between 40 and 70% of premature deaths and two thirds of all cases of chronic disability.

Will preventive and health promotion programs such as smoking cessation programs, diabetes control programs and most cancer screening programs impact significantly in the long term? What about the effect of regular exercise, healthful eating and clean air? Recent projections point to a further decline in cardiovascular mortality, stable levels of stroke, increases in melanoma and cataracts and a doubling of Alzheimer's disease incidence in the next 30 years.

Will quality of life be more important than quantity? Faced with an aging population, rising health care costs and limited resources, what social, economic and ethical trends will affect our medical underwriting perspective?

Should diabetics with severe generalized cardiovascular disease and other complications be eligible for kidney and heart transplants? Should age limits be set for certain treatments or procedures?

Should the predicted epidemic of lung cancer in women, as a direct result of smoking habits among today's adolescent girls, influence our present or future medical underwriting practices?

In general, the healthy elderly are not anemic and other parameters such as fasting blood sugar, serum electrolytes and blood gases are little changed with advancing age. On the other hand, an age related decrease in renal, pulmonary and immune functions is recognized.

Several studies have looked at clinical events or impairments in the elderly with or without comparison to younger individuals.

**ECGs**

Anderson and co-workers performed 24 hour electrocardiography monitoring in fifteen 73 year old and seventeen 82 year old subjects without known cardiovascular disease. All subjects showed supraventricular premature beats. Supra ventricular tachycardia was noted in 63%. 84% showed ventricular premature beats and more than one configuration was seen in 23%. Episodes of intermittent atrial flutter and fibrillation, high degree AV blocks and ventricular tachycardia.
were absent or rare. The findings are similar to those in other studies in the elderly and not significantly different from other populations. In contrast, an Australian review suggested atrial fibrillation (AF) was frequent in the unselected elderly and associated with increased mortality. Of 1770 people over age 60, 40 (2.3%) were in AF when first seen and 47 (2.7%) developed it during follow up. (Eight of the total had paroxysmal AF only). There was a positive association with history of angina, MI and left bundle branch block. All cause mortality after adjustment of other risk factors at 2–17 years follow up was 1.92 for other causes, 1.82 for cardiovascular causes and 3.78 for mortality from strokes. Of interest, relative mortality declined with advancing age for both males and females.

**Stroke**

Since the 1950s, an extraordinary decrease in mortality rate from stroke has occurred in the United States (15,16) (Table 1). These mortality rates have steadily dropped from 71.5 per 100,000 population in 1968 to 30.1 per 100,000 in 1987. The significant decrease in cerebrovascular mortality since 1968 was experienced by men and women equally.

**Table 1**

<table>
<thead>
<tr>
<th>Age</th>
<th>45+</th>
<th>45–54</th>
<th>55–64</th>
<th>65–74</th>
<th>75+</th>
</tr>
</thead>
<tbody>
<tr>
<td>Males</td>
<td>-21.0</td>
<td>-15.7</td>
<td>-16.5</td>
<td>-22.9</td>
<td>-21.8</td>
</tr>
<tr>
<td>Females</td>
<td>-18.0</td>
<td>-18.6</td>
<td>-17.6</td>
<td>-19.6</td>
<td>-17.3</td>
</tr>
</tbody>
</table>

Adapted from Metlife Statistical Bulletin — Vol. 70, No. 2

There are significant geographic variations in stroke mortality.

Men aged 45 and over in the East South Central states have the highest cerebrovascular mortality rate with an age adjusted death rate 34% higher than the national average. Age specific death rates reveal as expected a significant increase in mortality at ages 65–74 and ages 75+ (Table 2).

**Table 2**

<table>
<thead>
<tr>
<th>Age</th>
<th>45+</th>
<th>45–54</th>
<th>55–64</th>
<th>65–74</th>
<th>75+</th>
</tr>
</thead>
<tbody>
<tr>
<td>Males</td>
<td>129.7</td>
<td>23.1</td>
<td>62.8</td>
<td>197.8</td>
<td>859.2</td>
</tr>
<tr>
<td>Females</td>
<td>118.8</td>
<td>19.3</td>
<td>46.8</td>
<td>150.5</td>
<td>914.2</td>
</tr>
</tbody>
</table>

Adapted from Metlife Statistical Bulletin — Vol. 70, No. 2

In Canada, age standardized mortality rates for stroke in the elderly (age over 65) decreased by about 60% for women and 50% for men between 1951 and 1987. Differences are not evident between urban and rural areas but regional differences can be recognized.

Explanations for the decrease in mortality include greater awareness of and treatment of hypertension, improved patient care, changes in lifestyle and possibly changes in diagnostic criteria.

**Diabetes**

During the past 40 years, there have been important changes in the age adjusted mortality rates in diabetes mellitus. The rate peaked in 1968 at 14.7 per 100,000 and has steadily declined to 9.6 per 100,000 presently. White women have fared better than men (Table 3).

**Table 3**

<table>
<thead>
<tr>
<th>Year</th>
<th>Both Sexes</th>
<th>Men</th>
<th>Women</th>
<th>Both Sexes</th>
<th>Men</th>
<th>Women</th>
<th>Both Sexes</th>
<th>Men</th>
<th>Women</th>
</tr>
</thead>
<tbody>
<tr>
<td>1950</td>
<td>14.3</td>
<td>11.4</td>
<td>17.1</td>
<td>13.9</td>
<td>11.3</td>
<td>16.4</td>
<td>17.2</td>
<td>11.8</td>
<td>22.6</td>
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<tr>
<td>1955</td>
<td>13.0</td>
<td>10.9</td>
<td>14.8</td>
<td>12.6</td>
<td>10.9</td>
<td>14.1</td>
<td>16.5</td>
<td>11.2</td>
<td>21.6</td>
</tr>
<tr>
<td>1960</td>
<td>13.6</td>
<td>12.0</td>
<td>15.0</td>
<td>12.8</td>
<td>11.6</td>
<td>13.7</td>
<td>21.6</td>
<td>16.1</td>
<td>26.8</td>
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<tr>
<td>1965</td>
<td>13.5</td>
<td>12.5</td>
<td>14.4</td>
<td>12.5</td>
<td>11.9</td>
<td>12.9</td>
<td>23.6</td>
<td>18.1</td>
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<td>1970</td>
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<td>14.4</td>
<td>12.9</td>
<td>12.7</td>
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<td>25.2</td>
<td>20.4</td>
<td>29.3</td>
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<td>11.6</td>
<td>10.4</td>
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<td>21.7</td>
<td>17.9</td>
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<td>10.1</td>
<td>10.2</td>
<td>10.0</td>
<td>9.1</td>
<td>9.5</td>
<td>8.7</td>
<td>18.8</td>
<td>16.4</td>
<td>20.6</td>
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<tr>
<td>1981</td>
<td>9.8</td>
<td>10.0</td>
<td>9.6</td>
<td>8.8</td>
<td>9.3</td>
<td>8.4</td>
<td>17.9</td>
<td>15.6</td>
<td>19.5</td>
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<td>1982</td>
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<td>9.8</td>
<td>9.3</td>
<td>8.7</td>
<td>9.2</td>
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<td>9.8</td>
<td>8.9</td>
<td>9.2</td>
<td>8.6</td>
<td>17.8</td>
<td>16.0</td>
<td>19.0</td>
</tr>
<tr>
<td>1984</td>
<td>9.5</td>
<td>9.8</td>
<td>9.2</td>
<td>8.5</td>
<td>9.0</td>
<td>8.0</td>
<td>17.4</td>
<td>16.0</td>
<td>18.4</td>
</tr>
<tr>
<td>1985</td>
<td>9.6</td>
<td>9.9</td>
<td>9.4</td>
<td>8.6</td>
<td>9.2</td>
<td>8.1</td>
<td>17.7</td>
<td>16.1</td>
<td>18.9</td>
</tr>
<tr>
<td>1986</td>
<td>9.6</td>
<td>9.9</td>
<td>9.3</td>
<td>8.5</td>
<td>9.1</td>
<td>8.1</td>
<td>17.8</td>
<td>16.1</td>
<td>19.0</td>
</tr>
<tr>
<td>1987†</td>
<td>9.6</td>
<td>9.9</td>
<td>9.4</td>
<td>8.6</td>
<td>9.1</td>
<td>8.1</td>
<td>17.6</td>
<td>15.9</td>
<td>18.8</td>
</tr>
</tbody>
</table>

* Adjusted on basis of age distribution of the United States total population, 1940.
† Estimated.

Source: Computed by the Health and Safety Education Division of the Metropolitan Life Company, based on data from the Division of Vital Statistics, National Center for Health Statistics and the Bureau of the Census.
There is a sharp increase in mortality after age 54 and a near doubling in mortality each succeeding decade (Table 4). The pattern is similar among women and men.

As with stroke, significant disparities exist according to geographic location in the U.S. In the age group 65–74, the Mid-Atlantic states (New York, New Jersey, Pennsylvania) had the highest mortality (69.4 per 100,000) while the Pacific area (Washington, Oregon, California, Alaska, Hawaii) had the lowest (51.4 per 100,000) — an 18% difference.

| Table 4
| Diabetes
| U.S. Mortality Per 100,000 (1985) |
| Age | 45+ | 45–54 | 55–64 | 65–74 | 75+ |
| Mortality | 34.0 | 9.8 | 26.4 | 60.2 | 143.4 |
| Mortality | 33.4 | 7.9 | 25.8 | 59.4 | 151.2 |

Adapted from Metlife Statistical Bulletin — Vol. 70, No. 4

The 65–74 age group had a significant decrease in mortality for the period 1979–81 to 1985. Only Females age 45–64 fared better (Table 5).

| Table 5
| Diabetes
| mortality Per 100,000
| percentage Change
| 1979–81 To 1985 |
| Age | 45+ | 45–64 | 55–64 | 65–74 | 75+ |
| Males | -2.3 | -3.0 | -1.5 | -3.5 | -1.2 |
| Females | -3.2 | -9.2 | 1.6 | -5.4 | -1.5 |

Adapted from Metlife Statistical Bulletin — Vol. 70, No. 4

The 65–74 age group had a significant decrease in mortality for the period 1979–81 to 1985. Only Females age 45–64 fared better (Table 5).

**Hypertension**

Systolic and diastolic hypertension constitute risk factors for cardiovascular mortality in the elderly as they do at younger ages. In the elderly, the negative impact of systolic hypertension predominates. Treatment benefit is noted to age 80 but is less certain thereafter and must be weighed against the negative influence of therapy. In general, relative reduction of cardiovascular morbidity and mortality with treatment is the same or better for those over 60 compared to those under 50. Applegate provides a particularly good review of the topic.19

**Bypass Surgery**

Several studies appear to show that operative mortality related to aortocoronary bypass surgery for angina, duration of hospitalization and reoperation rates at five and ten years are not significantly different for those over age 65 compared to those ages 55 to 64. These results hold true even when bypass surgery is performed in the setting of prior MI, unstable angina or depressed left ventricular function.20

**Urinary Tract Disease**

In patients with renal failure subjected to kidney biopsy, idiopathic crescentic glomerulonephritis was four times more common in those over 60 and membranous glomerulonephritis three times more common. In this study, 25% of the elderly with a nephrotic syndrome had minimal change histology and therefore potential indication for glucocorticoesteroid therapy. In 1978–1980, those 55 to 64 years of age were the largest group of new patients entering the End Stage Renal Disease Medicare Program and those over 65 have the largest percentage increase of new entrants.21

Bacteriuria is associated with increased mortality in the elderly. The cause is assumed to be related to associated fatal diseases and correlated with the use of catheters in females and with the presence of malignancy in males. For elderly women with bacteriuria in one study, the five year mortality was 13.4%; those without bacteriuria but otherwise comparable had a 9.4% five year mortality.22

**Valvular Disease**

Uncertainty exists concerning the relative merits of valve replacement relative to balloon valvuloplasty for degenerative symptomatic aortic stenosis. In this context, Block recommends valve replacement with ballooning reserved for those who are cachectic, need emergency intervention, have a history of MI or class IV symptoms. Lack of enthusiasm for balloon stemming from residual stenosis rates, arterial damage, delayed mortality and need for reballooning in a high percentage.23

**Lymphomas-Leukemias**

More than one study has shown a negative influence of age on certain impairments. In one series of aggressive non Hodgkins lymphomas, in which all patients were otherwise comparable and identical treatment regimes were administered, there was a poor outlook overall but markedly and significantly worse in those over 60 (18% five year survival versus 47% for those under 60).24 Poor outlook for treated acute leukemias over age 60 has also long been recognized.25

**Psychiatric Disorders**

Depression is the most common psychiatric disorder of old age. It is doubly important in that it is also negatively associated with physical health. Studies conflict as to whether the incidence is higher or lower than at younger ages. Those living independently have about a 1–5% prevalence of major depressive illness with a higher risk of lower level depressive disorders and dysphoric states. For those institutionalized, some 10–20% met D.S.M. III R. criteria for major depression while over 40% have recognizable symptoms of depression to some degree. With organic brain syndromes, the depression rate is 20–25% and is twice as high in women compared to men. Those suffering from Alzheimer’s Disease have depression rates as high as 90% in some series. Overall, treatment of depression is considered equally effective in the elderly who tend to cope better with their depression than the young. Despite this, increased all cause and suicide mortality is recorded with suicide rates for elderly white males higher than for any other group.26,27,28

**Body Weight**

Harris and others have noted a U shaped distribution of increased mortality at the extremes of body mass index (BMI) in non smoking elderly patients. Low end mortality tended to be early and may reflect underlying disease or psy-
cho socioeconomic factors. Upper end mortality was longer term and increased 2x over the entire follow up period. All cause, cardiovascular and deaths due to malignancy were all increased.29

Finally, a number of impairments usually associated with younger ages are recorded not uncommonly in the elderly and should not be ignored. These include Crohn's disease30, hypertrophic cardiomyopathy31 and hyperlipidemia as a risk factor for coronary heart disease.32

Conclusion
Most elderly are not sick and live independently in the community. The early years of old age (65-75) are characterised by good health and relative psychologic, physical and financial independence. Advanced age (over 75 years), however, is more likely to involve increasing dependence due to the onset of disease and disability. Where as fewer than 2% of the 65-74 year age group are in long term care facilities, this increases to over 15% in the over 75 group (Woods Grodon 1984). Approximately 33% of those aged over 85 are permanently institutionalised. (Wilkins and Adams, 1983).

Medical underwriting of the elderly applicant should be based on functional age rather than chronological age; and one should use the same medical underwriting guidelines as for other age groups.

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25. 26. 27. 28. 29. 30. 31. 32.