

AIDS AND THE ACTUARY

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1. INTRODUCTION

THROUGHOUT this century we have become accustomed to regular improvement in mortality rates at most ages. For life office actuaries this trend could be regarded as a potential source of profit for assurance business, but as a possible source of loss for annuities. However, since the movements in mortality were gradual then mortality rates at any given time could be estimated with a fair degree of confidence.

In this relatively stable environment, there was little concern over the first report of a death caused by complete and unaccountable failure of the immune system in the United States of America in 1981. When the number of such deaths began to grow and to migrate to Europe then actuaries had to take notice. Here was a disease (called AIDS) which was causing deaths at an alarmingly increasing rate and which medical science seemed powerless to counter. Concern grew about the effect which a major increase in mortality rates caused by AIDS would have on the financial health of life offices.

The aim of this paper is to review the current state of knowledge of the AIDS disease, and the actions that actuaries are taking to protect the solvency of life offices.

The content of the paper has been split into four main sections, namely:

- (i) the nature of the disease.
- (ii) the results of Actuarial research into its effect on mortality.
- (iii) the effect on New Business.
- (iv) the effect on Reserving.

Most of the calculations have been carried out on my own basis (allied to AIDS mortality rates as produced by the Working Party). Where this has been done, sufficient information has been given to allow figures on a different basis to be calculated. Since no one basis is necessarily more correct than another, the calculations within this paper should be looked on as being for illustrative purposes only.

2. THE NATURE OF THE DISEASE

AIDS is a relative newcomer to the medical scene, the first case being reported in the U.S.A. in 1981. Since then it has become a world-wide problem, and has progressed at such a rate that it is now the largest cause of death for young males in the U.S.A.

After extensive research it was found that the disease was caused by a particular type of virus, known as a retrovirus. In 1983 this virus was identified separately by two groups of scientists, and is now known as the Human Immunodeficiency Virus (HIV). The virus is a minute organism, measuring one 1/10,000th of a millimetre in diameter.

The HIV is particularly attracted to cells of the immune and nervous system. The immune system consists of two types of cells, T-cells which help the body to repel viral infections and B-cells which repel bacterial invasions. While HIV seems to leave the B-cells alone, it causes damage to the T-cells leaving the body unable to fight-off viral infections.

Once HIV infiltrates the immune system, it reproduces continually. This means that once an individual is infected he is infected for life, and is capable of passing the virus on to others.

HIV itself does not kill. However, the damage caused to the immune system allows other infections (normally non-fatal) to attack without the body being able to defend itself. When this happens, the patient is diagnosed as suffering from Acquired Immune Deficiency Syndrome (AIDS).

The most common of these infections are pneumocystis carinii (a form of pneumonia), and Kaposi's sarcoma (a form of skin cancer). There are, however, a large number of different infections which have been reported in conjunction with deaths from AIDS.

Once AIDS is diagnosed, the expectation of life is very small. Current studies suggest that only about 50% of AIDS patients survive for a year, and 10% for three years.

It is not known how many people who are infected with HIV (usually described as HIV Positive) will go on to develop AIDS. At first, it was thought that about 20 to 30% would develop the full disease, but experts now believe that this figure is too low. Indeed there is a growing body of opinion which holds that everyone who has the virus will eventually fall victim to AIDS, but that the gestation period varies considerably from one person to another.

An individual who is infected with the virus may be completely unaware that he is a carrier. There are, however, some identifiers such as:

- (a) a blood test (called an ELISA Test) which can tell if the body has produced antibodies to HIV—if the antibodies are present then so also must HIV. The current form of the test can detect minute supplies of the antibody, but is still not 100% accurate since there seems to be a 6 to 8 week period after infection before the antibodies appear.
- (b) the tendency for the individual to fall prey to certain types of illnesses associated with those who are HIV Positive. The two major illnesses of this type are persistent generalized lymphadenopathy (PGL) which produces swelling of the lymph glands, and AIDS related complex (ARC) which causes weight loss, sweating and minor infections.

Transmission

Despite its fatal effects, the HIV is itself a very fragile organism and cannot survive for long outside the human body. It is also not very efficient in moving from one person to another, the only mode of transport being via bodily fluids, in particular blood, semen and mucus. Therefore, transmission can arise through sexual contact, the transfusion of infected blood, the use of infected hypodermic needles used for injecting into the blood stream, and from mother to foetus. It is also suspected that the virus can be passed on via breast-feeding.

From the above, we can see why there are certain groups of people who have a relatively high chance of becoming infected, such as:

- (a) the sexually promiscuous, especially male homosexuals and prostitutes. Given the larger number of people within the heterosexual community, there is a lesser risk of sexual contact with an infected partner. However, if the virus does become widespread within this latter group, the consequences could be devastating.
- (b) haemophiliacs, who receive regular blood transfusions to ensure an adequate supply of Factor VIII (a blood component vital to their well-being). Formerly, the major source of Factor VIII was the U.S.A., where the collecting service paid people to donate blood. These paid donors included a high proportion of drug addicts who were HIV Positive, which led to a very high proportion of haemophiliacs also becoming infected. However, since all blood products are now screened for the presence of HIV, future transmission by blood transfusions is unlikely.
- (c) intravenous drug users, who frequently share needles with others who may be carrying the virus.

There are also other victims, such as the sexual partners of members of the above groups and babies born to mothers who are HIV Positive.

Since there is little that medical science currently can do for those who are infected, the emphasis has been on prevention rather than cure. Thus, there have been major publicity campaigns primarily aimed at members of the above high-risk groups to encourage them to change their lifestyles to reduce the risk of infection (for example, by the use of condoms for sexual intercourse and by making available clean needles for drug users).

Current Experience

Despite its recent appearance, much effort has been put into compiling statistics of the number of HIV Positive and AIDS cases within the population. Obviously, as our knowledge of the disease increases, then the recording of results can be more accurate—therefore, it is not easy to compare, say, the number of deaths from AIDS in 1988 to those in 1985. Also, new AIDS cases in 1988 represent people who became infected, on average, 8 years previously (for example, the 1988 figures show large numbers of haemophiliacs contracting

AIDS, which we know to be an area where transmission rates are now virtually zero).

Within the United Kingdom, statistics are compiled by the DHSS. This body uses figures reported from the Communicable Disease Surveillance Centre (CDSC) for numbers of AIDS sufferers; figures from the Office of Population, Censuses and Surveys as well as the CDSC for numbers of deaths from AIDS; and returns from the various blood testing centres for numbers of HIV Positives.

The cumulative figures for the U.K. to 31 December 1988 produced by the DHSS give the following results:

- (a) There were 1,982 reported AIDS cases of whom 1,059 had died.
- (b) There were 9,603 confirmed HIV Positive cases.

Of the 1,598 AIDS cases, only 3.3% were females. Almost 70% of the cases were in people in the age group of 25 to 44, with a further 20% aged 45 to 64.

The figures for AIDS cases and deaths from AIDS can be broken down into particular groups as follows:

	<i>AIDS (%)</i>	<i>Death from AIDS (%)</i>
Homosexual/Bisexual Male	82.4	81.5
Intravenous Drug User	2.0	2.0
Homosexual and Intravenous Drug User	1.6	1.4
Haemophiliac	6.4	7.6
Recipient of Blood Transfusion	1.8	2.4
Heterosexual	3.8	3.0
Child of Infected Parent	1.0	.8
Other	1.0	1.3
Total	100.0	100.0

The data can also be split by the region in which the disease was first reported (which is not necessarily the place of residence). Examples of the figures produced are:

	<i>AIDS (%)</i>	<i>Death from AIDS (%)</i>
North Thames	58.6	56.2
South Thames	13.6	14.0
Yorkshire	2.3	2.6
Scotland	3.8	3.3

While the number of confirmed HIV Positive cases is considerably less than the total number in the population, the distribution gives a good illustration of the groups most at risk. Further, since these figures include a higher proportion of people who were recently infected than for the number of AIDS cases, then the distribution of HIV Positives may give a better picture of the current spread of the virus throughout the various groups.

Of the 9,603 HIV Positive cases reported, 16.4% occurred in Scotland. Within Scotland, approximately 59% of the reported cases occurred in Edinburgh, caused primarily by drug abuse. Of the remaining 8,025 cases, the distribution by transmission category was as follows:

	<i>HIV Positives (%)</i>
Homosexual/Bisexual Male	53.6
Intravenous Drug User	8.0
Homosexual and Intravenous Drug User	.9
Haemophiliac	12.4
Recipient of Blood Transfusion	1.0
Heterosexual	5.3
Child of Infected Parent	.4
Other	18.4
Total	100.0

The figure for the heterosexual group includes those who have contracted the virus in foreign countries where heterosexual transmission is common. The figure of 5.3%, however, does indicate the risk of future spread within the heterosexual population.

On an international scale, the spread of AIDS seems to be lower in the U.K. than in most other European countries. The table below shows the total number of officially reported cases of AIDS per million population at June 1988.

<i>Country</i>	<i>Cases per million population</i>	<i>Country</i>	<i>Cases per million population</i>
France	65	Italy	32
Denmark	52	Spain	29
Holland	36	UK	27
Belgium	34	Sweden	23
West Germany	34	Ireland	11

Source: World Health Organization.

The figures for some other countries outwith Europe are considerably higher; for example the Bahamas, Bermuda and the U.S.A. all registered more than 250. Some countries in Africa are believed to have much higher rates than this, though no accurate figures are available for them.

3. THE WORKING PARTY

Given the dramatic effect that AIDS is expected to have on mortality, there was immediate concern within the Actuarial profession. It was recognized that, along with more stringent underwriting, there would need to be some increases in premium rates for certain classes of business. Further, extra reserves would be needed to cover the extra deaths from AIDS for existing contracts.

The problem was that actuaries did not have any estimates of the current and future extra mortality that could be appropriate to the insured population.

To this end, an AIDS Working Party was established to research into the potential problems for the life assurance industry caused by the spread of AIDS. As well as keeping the industry informed of the current state of knowledge of the disease, the Working Party was charged with producing figures which would show the potential impact on mortality and morbidity on the U.K. population in general, and the insured population in particular.

The Model

The Working Party made use of a model projection devised by Professor David Wilkie. This model split the male population into four groups according to their AIDS risk. These groups were defined as Clear, At Risk, HIV Positive and Sick From AIDS. An individual would be placed in one of these four categories according to the following criteria:

- | | |
|----------------------|---|
| Clear Group | —he is not infected with HIV, and his lifestyle is such that he is not exposed to a higher than normal risk of becoming infected. |
| At Risk Group | —he is not carrying the virus, but his lifestyle is such that he has a higher than normal risk of becoming infected. |
| HIV Positive Group | —he is carrying the virus, but has not yet developed the full AIDS disease. |
| Sick From AIDS Group | —he has the full AIDS disease. |

The initial male population was split into these four groups, and allowance was made for individuals to transfer from one group to another. For example, individuals can move between the Clear and the At Risk Groups by changes in behaviour. New HIV Positive cases are generated by assuming homosexual interaction between those in the At Risk and the HIV Positive Groups.

No allowance was made for the possible spread of the disease into the heterosexual community, nor via intravenous drug users. This simplified the model and, on current figures, the error is small. It does illustrate, however, that even the most severe of the Working Party's projections may not represent an upper limit on the effect of AIDS.

Transition rates from the HIV Positive Group to the Sick From AIDS Group were calculated using a Gompertz formula, and vary by age, duration from infection and calendar year. On average, the duration from the date of infection to contracting AIDS is just over 8 years.

Once an individual becomes Sick From AIDS, his life expectancy would, on average, be no more than two years.

The initial population was based on estimates of the actual male population in 1983. For each projection, the numbers of deaths of those who were Sick From AIDS or HIV Positive up to 1986 were adjusted to reproduce the actual reported numbers of such deaths. Also, each projection was made to report the number of HIV Positive males at the end of 1986 to be about 30,000 (to be consistent with public estimates of this number).

The Projections

Six projections (A to F) were prepared with different parameter assumptions. Projection A is the most pessimistic of the six projections (though, as explained above, it does not represent an upper level to possible future experience). This projection assumes, for example, that there is no transfer from the At Risk

Group to the Clear Group, i.e. there is no significant change in sexual behaviour as a result of the publicity campaigns outlining the dangers of AIDS. It also assumes that 5% of the initial male population aged 21–50 are in the At Risk Group.

Projections B to E are based on the assumptions used for Projection A, except that one is weakened. Thus, compared to Projection A,

- Projection B allows for a steady transfer from the At Risk Group to the Clear Group from 1987 onwards.
- Projection C assumes lower rates of new HIV infections.
- Projection D assumes that mortality rates of those in the Sick From AIDS Group will decrease from their current levels (due to future medical advances).
- Projection E assumes that only 2.5% of the initial male population aged 21–50 are in the At Risk Group.

Projection F shows the effect of incorporating all of the revised assumptions used in projections B to E. It is, therefore, the most optimistic of the six projections. However, it may not represent a lower limit to the effect of AIDS since the initial population At Risk could be lower than that used in the projection, and the major public education campaigns could lead to a more significant change in people's lifestyles.

The Effect on General Population Mortality

The results from each projection showed broadly similar trends, in that the estimated number of deaths from AIDS rise from 1987 to the end of this century and then decline. This decline is caused by two features of the model:

- The disease can only be spread amongst those in the At Risk Group.
- In future generations, fewer will become infected, and at younger ages, than within the current generation.

By using a standard population mortality table based on the male population in England and Wales in 1983, the excess mortality due to AIDS can be calculated by age and calendar year. The general pattern for all six projections is to show that the most significant extra mortality occurs at ages 30–50, and calendar years 1995–2000.

Obviously, the size of the extra mortality varies according to the projection. For example, for a male aged 35 in 1997, the ratio of total mortality (including AIDS) to the 1983 (pre-AIDS) mortality is:

4.630	(Projection A)
1.913	(Projection F)

The Effect on Insured Population Mortality

Assured lives mortality is lighter than general population mortality. Therefore, it is obvious that if we assume the same AIDS development for current

assured lives as for the general population, then the proportionate extra mortality due to AIDS will be greater for assured lives than for general population mortality. For example, if we take current assured lives mortality to be 80% of A67/70 (duration 2 and over), then the ratio of total assured lives mortality (including AIDS) to the pre-AIDS assured lives mortality for a male aged 35 in 1997 is:

6.32	(Projection A)
2.68	(Projection F)

When discussing the effect of AIDS on the insured population, the Working Party restricted itself to three of the projection models, namely,

- Projection A —on pessimistic assumptions.
- Projection F —on optimistic assumptions.
- Projection BC—on moderate assumptions, combining the features of projections B and C.

Detailed discussions on the application of these projections to new and existing insured populations are given in later sections.

4. THE EFFECT ON NEW BUSINESS—UNDERWRITING

Anti-Selection

The Working Party produced mortality rates appropriate to individuals who are initially in one of the four AIDS-risk groups. For example, on Projection BC, we have mortality rates as follows:

Age	Year	Initial Status in 1987			
		Clear	At Risk	HIV Positive	Sick From AIDS
30	1987	.00056	.00056	.005	.505
35	1992	.00069	.00839	.159	.505
40	1997	.00114	.0601	.217	.505
45	2002	.00209	.0647	.222	.5

If a life office made no attempt to distinguish between these four groups in its underwriting, it would encounter the following problems:

- (a) It would need to assume an average distribution between the four groups for its new business. It could then produce premium rates on this assumption. However, it would need to monitor the actual distribution very closely since it could find that it is attracting more proposers (and with larger-than-average sums assured) from the non-clear groups. The effect of this would be heightened if other life offices made attempts to discourage proposals from the non-clear groups.
- (b) Where there are clearly identifiable groups which have very different mortality rates, they can be charged the same rates only if a deliberate decision is taken to provide a cross-subsidy. Further, there should be little

chance of advantage being taken of this by individuals within groups which have higher than normal mortality rates. However, due to the very large differences in mortality between the four AIDS-risks groups and also the actions taken by other offices, this could not be achieved in practice even if it was desired in theory.

The problems highlighted in (a) and (b) above are called anti-selection. This means that individuals in the non-clear groups, knowing that they will have a higher-than-average risk of dying from AIDS, will attempt to take out as much life assurance cover as they can get.

The threat of anti-selection makes it vital that an office tries to identify proposers in each of the four groups. For example, suppose that office A did not underwrite for AIDS and calculated its premiums on the basis of the distribution for each group which applies in the general population. In contrast, office B does try to underwrite out all proposers who are not in the Clear Group and, by doing so, can charge lower premiums. It is then likely that office A will find that a larger than expected proportion of its new policyholders come from the non-clear groups (who cannot be assured with office B). Therefore, its future mortality experience will worsen and the office may have to increase its premium rates even further. This will increase the gap in premiums between office A and office B, so that even more of the Clear Group will effect new policies with office B. Those in the non-clear groups, finding it impossible to be accepted by office B, will still be prepared to take out new policies with office A even at the higher premium rates. This will mean a further deterioration in future mortality for office A.

Thus, a vicious circle is created, with premium rates always following (rather than anticipating) worsening mortality experience.

Underwriting for AIDS

The above example highlights the need for a firm underwriting stance to categorize proposers into one of the four AIDS groups, and to accept or reject on that basis.

Sick From AIDS

It is not too difficult to identify proposers who are Sick From AIDS since they will already be suffering from an infection such as Kaposi's sarcoma. Given the fact that they can be expected to live for only about 12 more months, they must be declined.

HIV Positive

Those who are currently HIV Positive suffer a much heavier mortality than normal because:

- (a) they are susceptible to certain illnesses (such as PGL and ARC) while they are within the HIV Positive Group.
- (b) there is a strong likelihood of progression to the AIDS disease, with the resultant very high mortality suffered by members of that group.

The resultant premium loading needed to insure this group would far exceed any other substantial risk which is presently accepted with a loading, and this, together with the general uncertainty which still remains about the extent of risks (a) and (b) above, will force the office to decline proposers who are in this group.

Given this decision, the office must impose underwriting procedures which will identify proposers who are HIV Positive. To this end, the office could ask all proposers to undergo a blood test (see § 2). These tests are now very accurate, although it may not detect proposers who were infected within the last 8 weeks. While the blood test is the best method of detecting proposers who are HIV Positive, there are practical difficulties in asking all proposers to undergo blood tests, such as:

- public reaction would be unfavourable (and may deter those in the Clear Group, as well as others, from proposing with that office).
- underwriting costs would escalate dramatically, and would have to result in higher expense loadings within premiums (the cost of obtaining and analysing a blood sample is about £20, on top of the cost of employing more underwriting staff).
- the procedure would need the co-operation of the British Medical Association (BMA), since it is the members of that body who would do most of the tests (this co-operation may not be forthcoming, particularly in view of the need for appropriate counselling of those whose test proves to be positive).

In practice, offices have adopted a more practical approach, requesting blood tests only for sums assured over a certain level (which may vary by type of proposer). This, combined with the need for the proposer to answer the additional proposal questions described below, should help underwriters identify proposers in the HIV Positive Group.

At Risk

Individuals whose behaviour leaves them with a higher than average risk of HIV infection in the future must also be identified. The figures shown in § 2, show that the groups with a high risk of becoming infected are:

- homosexual and bisexual men.
- intravenous drug users.
- haemophiliacs.
- some members of the heterosexual group (such as the sexually promiscuous, the sexual partners of members of the above groups, and those who have lived in areas of the world where infection by heterosexual contact is common).

It should be noted that, given the screening for the virus which now happens on all blood used for transfusions, a haemophiliac who is not already HIV Positive is unlikely to have a higher than average risk of future infection, and so can be treated as a member of the Clear Group.

Unlike those who are already HIV Positive or Sick From AIDS, there are no

scientific tests which can identify members of the At Risk Group. Knowing this, and the risk their lifestyle involves, it is obviously tempting for individuals within the At Risk Group to attempt to take out as much life assurance cover as possible.

To counter this threat, life offices have introduced additional proposal form questions to try to elicit information which may help identify those in the At Risk Group. Generally, these questions ask the proposer if he/she has had any medical counselling or tests for AIDS, or been treated for any sexually transmitted diseases. The latter is designed to gauge how sexually promiscuous the proposer is (the more promiscuous he/she is, the greater the risk of becoming infected with HIV).

In addition, for certain types of proposer (for example, young single males) and for sums assured over a certain limit, additional information is requested via a Lifestyle Questionnaire. These are given to the proposer, not the broker, after his proposal form has been submitted, so that the proposer can answer the questions in complete privacy. Generally, these questionnaires ask if the proposer is in one of the high risk groups mentioned earlier in this Section.

This underwriting stance has been criticized by the BMA and the DHSS since it may deter people from having HIV blood tests, or attending STD clinics, so that they can truthfully answer 'no' to the relevant questions on the proposal form. Further, some proposers are tempted (or even advised) deliberately to lie on the proposal form, on the assumption that it will be too difficult for the office to detect this and refuse to pay out a claim. Booklets are available (for example, those published by the Terence Higgins Trust) which give advice to those in the non-clear groups on how to get life assurance cover.

The above shortcomings show how difficult it is for an office to identify those in the At Risk Group. As long as some offices do not use Lifestyle Questionnaires etc., then the above underwriting procedures should act as a deterrent for those in the At Risk Group but little more. Therefore, in setting premium rates, the office cannot assume that it will be able to identify all (or even most) of such proposers.

Much of the pressure for the introduction of these additional questions for proposals has come from the reassurance industry. For example, for a with-profit endowment policy, the life office will receive premiums which consist of allowances for expenses, mortality and bonus. If the mortality risk is reassured, then the reassurance company will only receive (from the life offices) a premium consisting of expense and mortality charges. If the mortality charge is too small in practice (as may happen if underwriting is lax) then there would be losses from mortality. The life office can withstand this by eating into the bonus loadings within the premiums (effectively reducing bonus rates), but the reassurance company has no such source to cover its losses.

Since most direct life offices have facultative treaties with their reinsurers, allowing certain classes of policies to be reassured automatically, then the reassurance company can exert pressure on the life office to have a strict underwriting policy on AIDS.

Special Classes of Business

While the above section describes the general position for life assurance underwriting, there are some areas of the industry which require special consideration.

Direct Response Marketing

Some offices appeal for business directly to some part of the population without them having requested it. The most common approach is via newspaper adverts which contain easy-to-complete application forms. Since the medical questions are short, and cannot be followed up in all cases, the office must accept that it will suffer a heavier mortality experience than for conventional proposers. In return, the office can charge higher than normal premiums, and can make considerable savings in expenses.

Given the stringent underwriting standards imposed for other types of business, such adverts could be appealing to those in the At Risk Group. Even if an AIDS question is asked, the chance of a claim being turned down due to non-disclosure is more remote than for conventional business.

The problem is alleviated, to some extent, by the type of product offered this way. Usually they are savings-type policies, where the mortality charge is relatively small, and protection-type policies which are primarily aimed at the elderly, where the effect of AIDS is minimal.

Group Business

Group life schemes are generally accepted with very little underwriting requirements. Often the office only requires a statement that the member was at work on a particular day for sums assured up to a certain level. Given this relative lack of underwriting, it could be felt that there is scope for those in the non-clear groups to effect assurances. However, membership of a group life scheme, and the scale of benefits provided by it, are generally not matters of individual choice so that the scope for anti-selection is reduced.

Rather than concentrating on individuals, the office must look at the nature of occupation and the area in which most of the members reside—both of these factors are known to be significant when comparing the risk of AIDS. For example, a large percentage of all reported U.K. AIDS cases occur in the Thames Region (see § 1) which obviously should influence the office in setting rates for schemes based in this area.

5. THE EFFECT ON NEW BUSINESS—PREMIUM RATES AND PRODUCT DESIGN

A life office cannot expect that its underwriters will be able to exclude all proposers in the Non-Clear groups. This problem is made worse by the dangers of anti-selection mentioned earlier. Thus, it is essential that the office monitors its premium rates and general product design by looking at its own experience, that

of the whole life assurance industry and the general population. It must also be aware of the actions of its competitors.

There now follows a discussion of the above points applied to the major classes of business currently available.

5.1 *Level Term Assurance*

Premium Rates

The average Term Assurance premium consists (approximately) of the following constituent parts:

mortality	50%
expenses	35%
profit	15%

It is obvious that the mortality risk must be properly costed to ensure a reasonable rate of return (and, more particularly, to avoid making a loss). The effect of AIDS is likely to increase the overall mortality of future generations of policyholders, despite the more stringent underwriting standards (which will also increase expenses).

Using the projected mortality rates produced by the Working Party (Bulletin 2) we can calculate the net premiums for a male aged 30 in 1988 based on different assumptions regarding the proportion of new policyholders in each of the four AIDS groups.

We assume that normal mortality (i.e. that suffered by members of the Clear Group) is 80% of A67/70 select (2). The extra mortality suffered by members of the non-clear groups is assumed to follow the Working Party's Projection BC. This extra mortality varies significantly according to Group (i.e. it is much higher for the Sick From AIDS Group than for the At Risk Group). It follows that the office must make an assumption as to how many new policyholders will be in each of the four AIDS groups. This, in turn, depends on how successful the office believes its underwriters will be.

As an illustration, the net premiums have been calculated on the following underwriting assumptions:

Assumption 1—the underwriters can exclude all proposers who are Sick From AIDS, but cannot easily identify those in the At Risk and HIV Positive groups. The percentages of new policyholders in each group will then follow the assumed percentages in the Working Party's Projection BC, which are approximately:

Clear Group	95.5%
At Risk Group	4.0%
HIV Positive Group	.5%

While this may seem a very pessimistic assumption, it should be pointed out that, even if the underwriters can identify some

of the proposers in the At Risk and HIV Positive Groups, any proposers in these two groups who do get accepted will tend to take out higher-than-average cover. This is the problem of anti-selection mentioned in § 3. The problem can be allowed for by increasing the assumed percentages of the Non-Clear Groups.

Assumption 2—compared to Assumption 1, the underwriters can exclude 25% of those in the At Risk Group and 50% of those in the HIV Positive Group, and replace them with members of the Clear Group. The assumed percentages in each group are then:

Clear Group	96.75%
At Risk Group	3.0%
HIV Positive Group	.25%

Assumption 3—the office has a perfect underwriting system, so that only proposers in the Clear Group are accepted.

Assumption 3 is most unlikely to be achieved in practice, but serves as a good optimistic comparison to the results produced from Assumption 1 (pessimistic) and Assumption 2 (moderate).

The resulting net premiums for 5, 15 and 25 year terms are shown in Appendix 1.1.

Using the results from Assumption 3 as the premiums which would be charged if AIDS had not appeared, we can see that the percentage increases in net premiums due to AIDS are:

	<i>Term (years)</i>		
	5	15	25
Assumption 1	72.0%	135.4%	72.4%
Assumption 2	40.0%	92.7%	49.7%

This shows the significant increases in net premiums which is necessary to cost for the extra mortality which will arise if the BC projection is accepted. Obviously, lower increases would result if Projection F was used, but BC has merits in that:

- (a) since extra valuation reserves may to be based on Projection BC, there is a consistency between valuation and premium bases.
- (b) extra expenses (for example, from underwriting, valuation and the constant monitoring of premium rates) may not be fully covered by the increases in expense loadings—therefore, there must be no losses from mortality.
- (c) it is essential that the extra mortality is not understated, given the fact that mortality constitutes about 50% of the total premium.

- (d) even if the actual extra mortality turns out to be on the Projection F basis, the use of Projection BC in the premium rates should give an extra rate of return to the providers of the office's capital—this seems only fair given the uncertainty they currently face.
- (e) even if the actual extra mortality suffered by the general population turns out to be on the Projection F basis, a life office may experience a higher rate of extra mortality given the threat of anti-selection.

For these reasons, most offices who have increased their Level Term Assurance premiums have done so on the Projection BC basis. Examples of actual premium increases for a Non-Smoker Male aged 30 next birthday for £25,000 of cover for a 15 year term, are:

Sun Life	+ 97.1%
G.R.E.	+ 122.9%
Friends Provident	+ 127.1%
Colonial Mutual	+ 135.9%

Source: Planned Savings

It is interesting to note that the average premium for the cheapest 10 offices has increased by just over 10% from 1987 (pre-AIDS) to 1988 (post-AIDS). However, the composition of this top 10 has changed significantly with offices which were formerly not competitive and which have not changed their rates now becoming very competitive.

Even for offices which have increased their rates, these increases have served to take premiums back to the levels of only 20 years ago.

We should also remember that U.K. premium rates have been very low compared to our European neighbours. To illustrate this, we show in Appendix 1.2 the minimum level term premium rates on offer in each country at the beginning of 1988 (i.e. pre-AIDS premiums).

This table shows that even with AIDS increases of about 100%, U.K. rates will still be highly competitive (remembering that offices in other countries should also be making AIDS increases).

Selective Persistency

It is not normal practice to include withdrawal rates within the premium basis, since the office will normally make a profit when the policy is lapsed (unless the reserve is negative at that date). If the actuary did allow for withdrawals, he would be anticipating profits which may or may not actually occur. In return, he could charge lower premium rates.

While it is generally prudent not to allow for withdrawals, this may not be the case in the post-AIDS world where the premium rates assume certain percentages in the non-clear groups. It is most unlikely that someone who is HIV Positive or At Risk, having succeeded in getting cover in the first place, will then lapse his policy. There is, however, no corresponding reason why those in the Clear Group will not continue to lapse their policies in the same way that

previous generations have done so. Further, it could be the case that in 5 years' time, say, the underwriters will be more effective in excluding proposers in the Non-Clear Groups. As a result, premium rates may fall dramatically (for example, in Appendix 1.1 from Assumption 1 to Assumption 3) for those who can satisfy the stricter underwriting requirements, i.e. members of the Clear Group.

It could be that these reductions in overall premium rates due to the reduced threat of AIDS could exceed the increase in rates due to increasing age at entry. In this case, it would be worthwhile for some members of the Clear Group to lapse their existing policies and effect a new policy at a lower premium. This problem is called selective lapse and re-entry. As well as occurring on better underwriting practices being introduced it may also be a real feature at the end of the century if the current models prove to be correct. At this time the extra mortality from AIDS is expected to fall significantly which will also bring premium rates down.

It is obvious that a steady stream of withdrawals from the Clear Group only will result in the average experience of the remaining policyholders being worse than if there were no withdrawals (or if they took place evenly throughout the different AIDS groups). Therefore, when setting premium rates, the actuary must gauge the effect of selective persistency (also called selective withdrawals).

To illustrate this, we can recalculate the Net Premiums of Appendix 1.1 using the following withdrawal assumptions:

Appendix 1.3—5% per annum

Appendix 1.4—5% per annum for the first 5 years, 8% per annum thereafter

These rates only apply to members of the Clear Group. No withdrawals are anticipated among members of the Non-Clear Groups.

Comparing the results in Appendices 1.1, 1.2 and 1.3 for Assumption 3 (i.e. the no-AIDS scenario) we can see that premiums would decrease significantly if withdrawals are anticipated (on a 5% withdrawal rate, there is a 27% fall for a 25 year policy).

However, the picture is different when we have policyholders in the Non-Clear Groups who do not lapse their policies. On the pessimistic Assumption 1, the net premium for a 15 year policy increases by 13% when a 5% withdrawal rate is introduced and by a further 2% if that withdrawal rate rises to 8% after 5 years.

These examples show how important it is for the actuary to allow for selective persistency when calculating premium rates in the post-AIDS world.

Options

In recent years there has been considerable pressure on offices to introduce certain options into standard term assurance contracts. Exactly how accurately they were costed for is a matter of some doubt, but there is no question that the advent of AIDS has brought about a serious investigation into the dangers of options.

The major problem is that those in the Non-Clear Groups are likely to take up all the options that are offered to them, whereas not all of those within the Clear Group will do so. This results in an increase in the proportion of policyholders (at least by sum assured) who are in the Non-Clear Groups.

For new policies, therefore, some options may be deemed too dangerous and will be removed altogether, while those that do remain will become more expensive to the policyholder.

As a simple example, consider a 15 year Level Term Assurance contract effected in 1988 by a male aged 30 next birthday.

At the end of year 5 and year 10 there is an option to increase the sum assured by 10%. If the option is missed at the 5th policy anniversary, it is not offered at the 10th anniversary.

To calculate the overall premium, the actuary must estimate what proportion of eligible policyholders will effect the option at the end of year 5 (say $T5\%$) and, of those offered the option at year 10, how many will take up the second option (say $T10\%$). Then he can calculate the cost of the assurance as follows (for an initial sum assured of £1,000):

- (a) Deaths within the first 5 years—all will receive £1,000.
- (b) Deaths within the 6th and 10th years— $(T5/100)$ of all deaths will receive £1,100 while $[1-(T5/100)]$ will receive £1,000.
- (c) Deaths within the last 5 years— $[(T5/100) \cdot (T10/100)]$ of all deaths will receive £1,210, $[(T5/100) \cdot (1-T10/100)]$ will receive £1,100, and $[1-(T5/100)]$ will receive £1,000.

While this is straightforward under Assumption 3 (i.e. all policyholders are in the Clear Group) the actuary must be more prudent where there are policyholders in the Non-Clear Groups (Assumptions 1 and 2). In these cases, he should assume that all policyholders in the Non-Clear Groups effect the options at the end of year 5 and year 10.

The resultant net premiums are shown in Appendix 1.5 where the take-up rate for the Clear Group is taken firstly as 50% for both options offered (i.e. $T5 = T10 = 50$), and then for comparison at 90%. To show the effect of the 100% take-up by the Non-Clear Groups, the net premiums have been calculated firstly assuming the 50% (or 90%) take-up rate applies to all the AIDS groups, and then by assuming that all policyholders in the Non-Clear Groups effect all options offered.

By comparing the results of Appendices 1.1 and 1.5, we can calculate the extra net premium being charged for the option. In the no-AIDS scenario (Assumption 3) the net premium increases from £0.82 to £0.86 (assuming a 50% take-up rate) i.e. an increase of 5%. However, where there are policyholders within the Non-Clear Groups the increases are steeper:

Assumption 1—increase of 10% (£1.93 to £2.12)

Assumption 2—increase of 9% (£1.58 to £1.72)

The higher the take-up rate, the more narrow is the difference in the percentage increase in net premium between Assumptions 1 and 3.

With the uncertainty over extra AIDS mortality compounded by the threat of this anti-selection (i.e. all policyholders within the Non-Clear Groups will effect all options offered), offices have had to review all the options offered within their current policies. Many have been withdrawn. For example, over 20 offices have withdrawn their Convertible Increaseable Renewable Term Assurance (CIRTA) contracts, while many others have restricted the options in some way. Those options that remain are now generally much more expensive for the policyholder than before.

General Product Design

Rather than counter the threat of AIDS by increasing premium rates (and by stricter underwriting) the office may try to alter the design of the contract to try to limit the possible losses.

Since there is still so much uncertainty over the future progress of the disease, then the life assurance practice of offering long-term rate guarantees is fraught with danger. Therefore, a move towards reducing these long-term guarantees may alleviate the problem, though the industry in general is reluctant to reverse the progress that has been made over the last two centuries in this area. Some of the possible product designs are now described.

Short-term Renewable Term Assurance—these policies generally have a term of no more than 5 years. At the end of this term the policyholder can renew the policy on rates offered by the office at that time, without evidence of health.

Traditionally, this policy has been unpopular with the public since, at renewal, premium rates can increase significantly due to the ageing factor. This, together with the general premium increases due to AIDS, will exacerbate the problem of selective persistency mentioned above, i.e. those in the Non-Clear Groups are likely to renew their policy no matter the extra cost. The more that policyholders within the Clear Group do not renew the policy, the higher the premiums the office must offer at renewal. Hence a vicious circle is created.

From the point of view of the office, this policy carries a much lower risk of significant loss if it gets its mortality costs wrong. However, it may find that the market for such policies is relatively small given the problems mentioned above.

Regular Re-underwriting—the office could offer a 25 year policy, for example, on guaranteed level premium rates for the full term, but at the end of every five years it reserves the right to re-underwrite for AIDS. This could be done by blood testing. If this proved positive, the contract would be cancelled.

This would obviously reduce the risk of selective persistency mentioned above, and so must be attractive to the office. However, it could face a dilemma

(and bad publicity) if one policy was cancelled because the policyholder was HIV Positive while another was continued even though the policyholder was close to death from a non-AIDS disease. The public would find this position very hard to understand.

This proposal may have more virtue if the policy offered options. Before the policyholder could effect such an option, he would need to submit to further underwriting (e.g. by a health statement, or a blood test). If he failed, his existing contract would continue but he would be offered no more options in the future. The public may be more willing to accept these conditions if the alternative was no options at all. It would then be up to the office to decide if the re-underwriting would be for AIDS only, or would include other illnesses.

In setting premium rates, the office would have to make allowance for the extra underwriting costs which would occur.

With-Profit Term Assurance—these contracts are widely available in continental Europe but are rare within the UK.

The premium rates would be set at a much higher level than for non-profit contracts, with bonuses being applied either to reduce premiums or to pay a lump sum on expiry.

The former is little more than a Renewable Term Assurance (as described in (a) above) with a maximum premium rate that can be offered at renewal. The latter choice (lump sum at maturity) is perhaps more attractive to the office since it gives it a better idea of the experience before determining the bonus to be paid. In this case, the non-profit premium would need to be increased to fund a pure endowment of the estimated amount of the bonus at the expiry date. If the reserve of the pure endowment element always covers the present value of the future extra mortality cost due to AIDS, then there is an effective surrender penalty which tends to reduce the problem of selective persistency.

The main drawback could be market resistance, with the public unwilling to pay even higher premiums than for conventional non-profit contracts.

Exclusions—the office could reserve the right to turn down a claim if the policyholder had died of AIDS or an AIDS-related condition (or, even more stringently, if the policyholder was HIV Positive at the date of death).

For a life office this may be attractive since it reduces the uncertainties within premium calculations and reserving. The exclusion clause would also act as a deterrent to proposers who are in the Non-Clear Groups and, as such, may reduce underwriting costs. Finally, it may be good from a marketing point of view to be able to offer term assurance at premium rates significantly below those of other offices.

However, there are major problems with such policies, especially arising from the fact that AIDS is not a notifiable disease and that death certificates may not make it obvious that the cause of death was AIDS. Currently, lack of proof and/or an unwillingness to cause offence results in some death

certificates not indicating that the cause of death was AIDS. Indeed, the number of such incomplete certificates could increase if the doctor knew that the individual had had a life assurance contract which had an AIDS exclusion.

Given these problems, the office would need to have a very strong claims procedure. Some claims could be turned down immediately, while the settlement of others would need to be delayed until further evidence of the cause of death was obtained—in both instances, the office could face considerable moral pressure to pay the claim. Disputed claims could be taken to court where it would not at all be certain that the judiciary would uphold the office's stance. The office would have to try to make the policy wording as comprehensive as possible, but it cannot be totally watertight given the current gaps in our knowledge of the disease. It would also need to ensure that the nature of the exclusion clause was clearly highlighted on all sales literature to avoid the policyholder appealing to the court on the grounds that the exclusion had not been properly explained when the policy was taken out.

It is obvious from the above that an office could not expect to be able to identify and disallow all AIDS claims. If it thought that, say, 75% of all AIDS claims could be denied then it would only need to allow for 25% of expected future AIDS claims in its premium rate calculations. Further, the deterrent effect may mean that the office can assume a higher proportion of new policyholders being in the Clear Group than if no exclusion applied. However, it must continue to employ stringent underwriting procedures to exclude proposers in the Non-Clear Groups, and not rely on the deterrent effect alone.

Even though the resultant premiums will be cheaper than those for contracts with no exclusions, there may not be a large market for them. The exclusion clause may be unacceptable to third parties, for example by banks to cover a loan. Further, given the widespread fear and ignorance of AIDS, even proposers who are in the Clear Group may be unwilling to take the chance that they will not contract the disease by accident in the future.

Due to the problems mentioned above, there is only a small number of offices which offer term assurance contracts with AIDS exclusions. The situation with PHI contracts is, however, very different as is discussed in § 5.5.

5.2 *With-Profit Contracts*

Premium Rates

Given the high savings element in each With-Profit premium, the cost of mortality is obviously very much lower than for Term Assurance contracts. Consequently, the effect of the extra mortality caused by AIDS has a much lesser effect on With-Profits premium rates.

The calculations of Appendix 1.1 have been repeated in Appendix 2 for With-Profits Endowment contracts (where the Assumptions 1, 2 and 3 are the same as those defined in § 5.1).

Taking the premiums for Assumption 3 as those representing the pre-AIDS scenario, the percentage increases in net premiums due to AIDS are:

	<i>Term</i>		
	5	15	25
Assumption 1	·05%	·73%	1·91%
Assumption 2	·03%	·47%	1·30%

Given the relatively small increases, the office may decide not to enforce any premium rate increases at all for With-Profits contracts. The cost of the heavier AIDS mortality would then be met out of surplus which would obviously endanger current bonus rates.

However, reducing current bonus rates could introduce inequity between different generations of policyholders. For example, most AIDS deaths may arise in the age groups 20 to 40, so that policies of 20 years' or more duration would have little or no extra AIDS mortality but would suffer from the lower bonus rates just the same. Even within recent generations of policyholders, there would be inequity between those in the Clear Groups and those in the Non-Clear Groups (whose AIDS risks are being partly paid for by those in the Clear Group).

To try to achieve a more equitable solution the office could change its bonus structure to reduce the amounts payable on death within the first few years of a contract (where, on average, the policyholder will be in the age range where most deaths from AIDS occur). This could be achieved by one or both of the following:

- (a) Having higher rates of bonus on existing bonus than on the sum assured. The rates could be calculated so that maturity pay-outs for, say, a 25 year endowment would be little changed from those on current bonus rates, but that the sums payable on early death would be reduced.
- (b) Having a Terminal Bonus structure which pays much lower rates on early death than for maturity. If the rates were defined as a percentage of existing bonus, the percentage varying with duration in force, then this would achieve the described effect, especially if it was combined with option (a).

As well as trying to achieve equity between different classes of With-Profits policyholders, the office must also ensure that the overall surplus is not adversely affected by the major problems caused by AIDS on Non-Profit Risk business. In the past a small but significant part of the surplus arose from such Non-Profit business. The With-Profits policyholders must be satisfied that the actions of the office with regard to Non-Profit new business are such that there will be no adverse effect on future surplus. They must accept, however, that any extra reserves needed to be set up for existing Non-Profit business may have to be paid for out of their surplus (unless the office can meet it out of hidden reserves).

Selective Persistency

After one or two years, a surrender value is normally payable. Therefore, a surrender penalty can be imposed to cover the possible losses due to selective persistency.

The only remaining problem is that there may be high lapse rates within the Clear Group during the first one or two years when no penalty can be imposed. However, given the relatively small effect that AIDS has on premiums then the likelihood of a large number of lapse and re-entries within the Clear Group is minimal.

General Product Design

There are two special classes of With-Profits Endowments which are common throughout the industry. We now briefly look at their design with regard to the threat from AIDS.

Low Cost Endowment—these policies are designed to repay a mortgage at maturity or on earlier death. The total sum assured is the sum of a With-Profits Endowment amount and a Decreasing Term Assurance. The total premium is similarly split into endowment and term elements.

For the With-Profits part, the comments made above apply. The only special consideration for the office is that it may not want to cut its bonus rates by so much that the maturity proceeds would not repay the mortgage (currently the policy is based on the assumption that future reversionary bonuses will be 80% of current rates).

Since the death benefit for the first $\frac{3}{4}$ of the policy term, approximately, is the total sum assured then the comments made above regarding amounts payable on early death are not appropriate.

The premium rates for the Decreasing Term Assurance element should be increased to cover the extra AIDS risk. However, the office may feel that there will be a higher proportion of proposers in the Clear Group for Low Cost Endowments than for other term assurance contracts since the Low Cost policy is generally taken out by married couples (who do not have a high risk of HIV infection). Also, since the term premium is small relative to the endowment premium then the threat of selective persistency is much lower than for term assurance contracts.

For these reasons, the office may not increase the Decreasing Term premium element of a Low Cost Policy by as much as it would for a general Term Assurance contract.

Flexible With-Profits Endowments—these policies are generally written to a specific maturity age (65, say), but with guaranteed cash-in terms after 10 years.

The marketing emphasis is generally placed on the benefits after 10 years and as such they are primarily investment vehicles with relatively low death benefits. Hence, the AIDS risk is negligible for these contracts.

5.3 Unit-Linked Contracts

Premium Rates

To illustrate the effect of AIDS on offices writing unit-linked contracts, we use as an example a common form of contract namely the Flexible Unit-Linked Whole of Life Policy (often referred to as Universal Life).

For a given premium the policyholder can choose how much death cover he wishes to have. Once the mortality cost for this death benefit has been deducted, the balance of his premiums are invested in units to provide a savings element. There is a review period (often at the end of every 10 years) when different levels of cover can be chosen. At this review period the office may also have the right to change its mortality charges.

Obviously, if the policyholder elects to have the minimum death cover possible (generally 7.5 times the Annual Premium to ensure that the policy is qualifying) then the contract is mainly being used as an investment vehicle, whereas if he chooses the highest death cover possible then it is primarily a protection policy.

It may be felt that, compared to the rigid premium structure of conventional business, the ability of the office to change its mortality charges at the end of every 10 years will give adequate protection to the office against possible losses due to AIDS. The current mortality charge is guaranteed only for 10 years, and if this turned out to be insufficient it may even be possible to raise the mortality charges by such an amount at the next review to recoup earlier mortality losses.

However, in practice it might not be possible for the office to increase its mortality charges by the full amount necessary to cover the extra cost of AIDS mortality. This could arise from restrictions within the policy itself, competition, or the dangers of selective persistency (i.e. the higher the increase in mortality charges the greater the lapse rate within the Clear Group which means the mortality charges actually made turn out to be insufficient which forces the office to raise them again, and so the vicious circle continues). If the office feels that it may not be able to increase mortality charges sufficiently in future then it must allow for this when doing the initial profit-testing, and set up additional Sterling Reserves where necessary.

Obviously the effect of AIDS on the profitability of the business is much lower if most contracts were effected primarily as investment vehicles rather than protection policies. If this was the case then the office may not need to impose drastic changes in its premium/benefit structure, though it would need to monitor its experience to guard against any significant change in its distribution of new business.

Options

Unit-linked contracts have generally offered a large number of options such as:

- increasing death cover in line with RPI (and in some cases above RPI).
- open ended conversion options.

—guaranteed insurability options.

—options to reinstate past options that were not taken up.

Other than automatic RPI linking of the death cover, there is little doubt that these options are very dangerous in the post-AIDS climate. The results for level term assurance show that the prudent assumption that all those in the Non-Clear Groups effect all options offered to them results in very significant increases in cost.

The consequence of this has been a fall in the number and scope of options being offered under unit-linked contracts, and an increase in the charges being made for those that remain.

5.4 Group Life

General features of the Group Life market before the dangers of AIDS were known, included:

- (a) Rate Guarantees—the premium rates charged were guaranteed for a fixed period (in the past this was usually 5 years, but more recently a 2 year period was more common since this produced savings in Stamp Duty).
- (b) Area/Occupational Loadings—different premium rates were often charged according to geographical area and type of occupation.
- (c) Experience Rating—rebates or bonuses could be paid if the actual mortality costs were less than those expected.
- (d) Competition—intense competition forced premium rates down and resulted in schemes regularly switching from one office to another.
- (e) Free Cover—up to a certain Sum Assured cover would be granted without medical evidence.
- (f) Continuation Option—when a member of the scheme left he would be offered the chance to effect an individual life assurance policy for a Sum Assured up to the level of that which he had had under the scheme.
- (g) Unit Rate Costing—for large schemes the office would assume a certain distribution by age and thereafter calculate the actual premium by reference to the total Sum Assured.

While there are few statistics available so far, the office must expect the future experience of its Group Life schemes to follow that of the general population. It should, therefore, increase its standard premium rates accordingly.

Further, since we have already shown in § 1 that the incidence of AIDS is not uniformly spread throughout the U.K. then the office may make different increases for AIDS according to area. Lack of data, however, may not make it possible to introduce differential AIDS costs according to occupation.

Since the extra mortality costs will apply only for certain classes of individuals (for example, males aged 20 to 40) then the office will need to look at its procedures for granting a Unit Rate premium costing, and the underlying membership distribution assumptions.

Looking at the other features mentioned above, the following comments apply:

Rate Guarantees—these should be no more than 2 years to avoid possible anti-selection.

Experience Rating—the actual rebate or bonus is calculated by looking at the past experience, and is generally available only for relatively large schemes where a large experience can be built up fairly quickly. This system is satisfactory when mortality is stable or improving but it is not so easy to apply when a worsening mortality experience is anticipated. For this reason the office may need to hold back more of the profits earned so far to cover possible future losses rather than distributing it to the scheme.

Free Cover—the underwriting considerations have already been discussed in § 4. Anti-selection is generally only a problem in non-compulsory schemes.

Continuation Option—in the past these were not taken up in any great quantity, and the office made only an arbitrary charge for it (1%, say, of the Group Life premium). However, the high possibility of anti-selection has resulted in more attention being paid to these options in the post-AIDS climate. The office could increase the cost of the option, but this could lead to the charge being 5 to 15% of the Group Life premium. It is unlikely that the scheme would be willing to pay this much for employees who choose to leave.

Alternatively, it could restrict the benefit available to the leaving member either by restricting the Sum Assured or the type of policy (for example, an endowment maturing no later than the Normal Retirement Date). Also, it could ask for evidence that the leaving member was not HIV Positive before granting the option.

Finally, it may seem simpler to the office and to the scheme to remove this option altogether. This has already been done by a large number of offices.

Competition—given the frequent changes of insuring office, it may be tempting for a scheme which has some HIV members whom the current office knows about, to try to change insurer to an office who will not be aware of this information. Offices must be aware of this danger when formulating their underwriting procedures.

5.5 PHI Business

The Effect of AIDS

It is generally the case that the heavier the mortality assumptions within a PHI premium basis, the cheaper the resultant premium. Therefore, it may be felt that the presence of AIDS will allow offices to decrease their premium rates (or to make more profits from their existing rates).

Unfortunately, the position is not as favourable as this.

The criterion for deciding whether or not a PHI claim should be met is not the

degree of illness but whether the policyholder is unable to work because of it. If admitted, the claim will continue until the policyholder dies, recovers or survives to the policy expiry date.

Obviously, someone who is sick from AIDS is unlikely to be able to work and so may be able to make a claim on the policy. While the current life expectancy of someone with AIDS is only about 12 months the office must be aware of the likely development of drugs which will extend this period without actually offering a cure.

Someone who is HIV Positive but has not yet developed the AIDS disease may also suffer from a variety of illnesses which could result in PHI claims. We have already discussed ARC and PGL (see § 1.1), while there is also the danger of progressive dementia.

As well as these physical diseases there are also psychological repercussions. A person who is HIV Positive may feel that there is pressure put on him by others to stay away from work as often as possible. Indeed, for Group PHI schemes the employer may put pressure on the office to admit the HIV Positive employee as a claim to placate the workforce. The office may have difficulty in convincing the employer that the risk of infection in the work place is minimal. Therefore, it would be prudent for the office to expect a sizeable proportion of HIV Positive policyholders to make a claim.

In the Working Party's AIDS Bulletin No. 3 the following figures were produced to show projected numbers within the population who will be HIV Positive and Sick from AIDS.

<i>Year</i>	<i>Projected Numbers (thousands) of</i>					
	<i>HIV Positive</i>			<i>Sick from AIDS</i>		
	<i>1992</i>	<i>1997</i>	<i>2002</i>	<i>1992</i>	<i>1997</i>	<i>2002</i>
Projection A	413	393	178	13	74	61
Projection BC	211	185	86	11	37	29
Projection F	141	94	38	14	42	32

It is obvious from these figures and the above comments that there is considerable danger to the office from higher PHI claims in the future. The office has basically two courses of action—either to increase premium rates or to introduce an AIDS exclusion. These options are discussed in the next two sections.

Premium Rates

In Bulletin 3 the Working Party calculated the present value of sickness benefit of £1 per week using an interest rate of 6%, Deferred Periods of 1 and 26 weeks and a Benefit Expiry Age of 65. Three assumptions were made regarding the condition on which the benefit would be paid, namely:

- (1) benefit is payable on all forms of sickness except those arising from being HIV Positive or Sick from AIDS,

- (2) benefit commences only when the policyholder becomes Sick from AIDS,
- (3) benefit commences only when the policyholder becomes HIV Positive.

In Assumptions (2) and (3), once benefit commences it continues until death.

For Assumption (1), the sickness basis was taken from the CMI 1975-78 investigation, while for Assumptions (2) and (3), the Working Party's Projection BC was used.

The results were:

Assumptions	Deferred Period					
	1 Week			26 Weeks		
	(1)	(2)	(3)	(1)	(2)	(3)
Age Next Birthday						
30	11.75	1.07	8.76	3.30	.73	8.23
40	16.73	1.03	8.60	5.50	.70	8.08
50	22.10	.70	6.77	8.49	.47	6.33

While the additional cost of providing PHI claims for policyholders who are Sick from AIDS is not very large, it must be remembered that the development of life prolonging drugs will increase these costs.

It is apparent that the extreme scenario of paying PHI claims for policyholders who are HIV Positive (and not necessarily ill) is very expensive. While the office would in practice only pay a claim when the policyholder was absent from work, the physical and psychological problems mentioned earlier may result in an HIV Positive policyholder being off work for a considerable amount of time, thus causing extra costs which are not far removed from those of Assumption (3).

Given the size of these possible premium rate increases and the doubt that surrounds the future claims experience, most offices have instead opted for AIDS exclusions (though often accompanied by some premium increases).

AIDS Exclusions

Unlike life assurance contracts the presence of exclusions is quite common within PHI policies; for example, the policy may state that no benefit is payable on sickness which was self-inflicted. Therefore, an AIDS exclusion is likely to be more acceptable to the market for PHI business than for life assurance contracts.

From the office's point of view, it should be easier for it to control claims for PHI policies—since the policyholder is alive when a claim is made it is more feasible to determine his HIV status.

Given that an AIDS Exclusion Clause is practical and desirable, the office must give careful thought to the type of exclusion to make. These include:

- (i) The policy becomes void if the policyholder becomes HIV Positive (it is likely that the office would refund all premiums paid since the date of infection).
- (ii) Claims would not be paid if the sickness arose from HIV infection (for example, ARC or AIDS) but claims from illnesses not related to HIV would be admitted.

- (iii) A policyholder who is HIV Positive could only make a claim for accidental injuries that are not self-inflicted.

The public is likely to prefer option (ii) since it gives the widest form of cover, but there could be disputes in the future as to what forms of sickness were related to HIV status. The office might feel that options (i) or (iii) would be easier to enforce, but it may fear the policyholder making an appeal to the Courts that the exclusion was unfair and/or that it had not been fully explained at the point of sale.

No matter the type of exclusion used, it is vital that the office makes the nature of the exclusion very clear on all marketing literature and proposal forms.

Even if an exclusion is inserted into the policy the office must still endeavour to underwrite out all proposers in the Non-Clear Groups to prevent people taking out policies which will be of little benefit to them, and to reduce the number of future claims which have to be disallowed (which could produce moral and legal opposition).

It would be costly for the office to insist on blood tests at each claim and in practice these would be required only for special classes of illnesses and policyholders. Thus, while the AIDS Exclusion Clause will reduce the size of future AIDS claims, it is unlikely to be 100% successful and so there should be some increase in premium rates (but not to the extent of those indicated by the figures in § 5.5).

The introduction of exclusions may have severe effects on the Group PHI market. Either the employer chooses to pay a very high premium for a contract with no exclusion or else he accepts the exclusion clause. In the latter case if his sick-pay scheme was unchanged (i.e. benefits were payable on all forms of sickness) then the risk of paying claims to employees who are HIV Positive is transferred from the office to the employer—this could be thought of as defeating the whole purpose of having a Group PHI contract.

6. THE EFFECT ON CURRENT BUSINESS

In spite of all the actions which the office can make with regard to new business (for example, on underwriting, premium rates and product design), it can do little to alter the terms of its existing business. It is likely that there are policyholders who are At Risk, HIV Positive or Sick from AIDS who took out policies at rates which did not anticipate extra mortality from AIDS. To this end, in 1987 the Government Actuary advised all Appointed Actuaries that he expected them to investigate the effect of AIDS on their current business and, if necessary, to set up extra reserves. No detailed rules were given as to how these extra reserves were to be calculated, it being left to the Appointed Actuary to measure the effect of AIDS on the office's particular mix of business.

The Appointed Actuary must first decide on the likely proportions of its policyholders who are in the four different AIDS risk groups. The Working Party

has produced mortality rates by age and calendar year which are suitable for the general population. It is tempting for the Appointed Actuary to use these rates on the assumption that the proportions of existing policyholders who are in the four risk groups are the same as those for the general population—this assumption must, however, be questioned.

The AIDS risk is particularly high among young, single males. This group perhaps had less inclination to take out life assurance policies in the past, and so it may be thought that the proportions of existing policyholders within the Non-Clear Groups are less than for the general population. On the other hand, in the period between 1982 and 1985, those in the Non-Clear Groups may have become aware of the AIDS risk and so effected life assurance contracts for large sums assured before the life offices became aware of the danger of AIDS to their finances. There is certainly evidence of this anti-selection in the U.S.A. where, in 1986, the average sum assured paid on AIDS claims was 2.5 times that for all other death claims.

As well as these considerations, the Appointed Actuary should examine the distribution of existing business by area, social group and, if known, by type of employment. Other factors which may affect the AIDS risk for current business include the office's rate of growth in recent years (since rapid growth may have been accompanied by anti-selection), and the office's marketing and underwriting strategies (for example, direct marketing campaigns may have resulted in significant anti-selection).

Only when the above investigations have been made can the Appointed Actuary determine the likely proportions of the four risk groups for his existing portfolio of business.

Levels of Reserves

For illustration purposes, we can assume that the proportions in the four risk groups for existing business mirror those for the general population, and that the latter can be adequately represented by the Working Party's model.

In Appendix 3 we show the reserves after 10 years for a Level Term Assurance effected by a male aged 30 next birthday at entry for a 25 year term. These figures show that the office must set up the following extra reserves per £1,000 Sum Assured.

<i>Projection Basis</i>	<i>Extra Reserves (£)</i>	<i>Extra Reserves as a Percentage of Non-AIDS Reserve</i>
F	7.390	50.5
BC	13.527	92.4
A	23.938	163.5

These reserves have been calculated using assurance and annuity factors on the relevant AIDS basis, but with a net premium calculated using a no-AIDS mortality basis to reflect the fact that the office premium has been calculated in this way.

It is not practical to do these calculations for all existing policies since it involves the application of mortality rates which vary by age and calendar year. However, representative calculations must be made to gauge the effect of AIDS on the overall portfolio of existing business.

Obviously, the size of the AIDS reserves depends on the mix of business and the extent to which that business has been written on long-term rate guarantees. Thus, an office which has a very high proportion of long-term temporary assurance contracts will need a higher AIDS reserve than one which writes mainly short-term investment-type contracts.

For Unit-Linked business the office must carry out a cash-flow analysis of existing business with regard to the extra mortality from AIDS and its ability to increase mortality charges. Extra Sterling Reserves should then be set up on the basis of these results. While this may make little or no change to the policyholder's expectations, it will result in a reduced profit flow for the office. This could cause serious cash-flow problems for a growing office.

If some existing policies have options these must be examined more carefully than in the past, in the light of the calculations and comments made in § 4.

Reserving in Practice

In practice, at the end of 1987 many offices set up extra AIDS reserves on the basis of Projection F with the intention of moving to reserving on Projection BC within one or two years. In some instances these extra reserves have been substantial—for example, the Mercantile & General Reassurance Company set aside £60 million to reflect its high exposure to risk business.

On the other hand, many offices did not set up specific AIDS reserves. They are likely to have justified this to the D.T.I. by showing that their 'hidden reserves' (for example, from margins in their valuation basis) are sufficient to cover the necessary AIDS reserves.

For example, an office's current mortality basis may be A67/70 unadjusted, whereas its actual mortality experience would support the use of a two year age deduction (i.e. an x-2 basis). The office could recalculate its liabilities on this x-2 basis and add this to the present value of the extra cost of future deaths due to AIDS. If this combined reserve is less than the reserve calculated on its current valuation basis (i.e. A67/70 unadjusted with no allowance for AIDS) then the office may legitimately claim that it has reserved for AIDS.

For the 1988 D.T.I. Returns the Government Actuary has written to all Appointed Actuaries to clarify what form of AIDS reserves are expected. Essentially, this guideline suggests that AIDS reserves be calculated using Basis F. Unlike the examples given above, however, offices will be allowed to reserve Net Premiums calculated using the heavier mortality basis (inclusive of AIDS) as long as the difference between Office and Net Premiums still leaves sufficient provision for expenses.

As described above, offices will be allowed to eat into their current margins as long as sufficient margins remain to constitute an appropriate reserving basis.

The Actuary's Report contained within Schedule 4 will have to give a description of his reserving basis, including how he has allowed for AIDS. Actuaries have been warned that this piece of information will be one of the first things which the D.T.I. will look at on receipt of the 1988 Returns.

Other measures to control levels of reserves

Although the office may feel it is almost powerless to prevent AIDS deaths from current policyholders, it may consider putting funds into public AIDS-awareness campaigns. A major input by the life assurance industry may help to reduce future HIV infection rates and so reduce the number of deaths from AIDS. This would inevitably reduce the cost of AIDS to the life assurance industry, as well as enhancing its image in the eyes of the public.

7. CONCLUSION

The life assurance industry has been criticized by some people for over-reacting to the threat of AIDS. However, given the fact that AIDS is now the largest killer of young males in the U.S.A., and is spreading fast throughout the rest of the world, it is impossible for the actuarial profession to ignore it.

Our state of knowledge of AIDS is currently very limited and much of the data being used is based more on judgement than fact. This being the case, it is essential that the life assurance industry takes all possible steps to protect solvency. Thus, it is better to take action on relatively pessimistic assumptions at the moment than to bow to public pressure to do only the minimum. At a later date, when our knowledge is more complete, it will be easier to weaken bases from a position of strength than to try to recover losses which resulted from methods which turned out to be too weak in practice. In the former case, only the theoretical question of equity is involved whereas the latter will involve the very solvency of the office itself.

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9. REFERENCES

- INSTITUTE OF ACTUARIES AIDS WORKING PARTY (1987). Bulletin No. 1.
- INSTITUTE OF ACTUARIES AIDS WORKING PARTY (1987). Bulletin No. 2.
- INSTITUTE OF ACTUARIES AIDS WORKING PARTY (1988). Bulletin No. 3.
- SOCIETY OF ACTUARIES TASK FORCE ON AIDS (1988). *The impact of AIDS on Life and Health Insurance Companies—A Guide for Practicing Actuaries.*

- BRODT, H. R., HELM, E. B., et al (1986). *Spontaneous Course of LAV/HLTV-III Infection*. Deutsche Medizinische Wochenschrift III, pp. 1175–1180.
- COWELL, M. and HOSKINS, W. (1987). *AIDS, HIV Mortality and Life Insurance*. Society of Actuaries
- WILKIE, A. D. (1988). 'An Actuarial Model for AIDS'. *Journal of Royal Statistical Society, A*, **151**, pp. 35–9.
- Munich Re (1988) 'Changes in Life Office Practice Due to AIDS'

APPENDIX 1.1

Level Term Assurance

Net Premium Rates per £1,000 Sum Assured

Premium Basis:

interest rate = 6%

normal mortality = 80% of A67/70 select (2)

extra AIDS mortality—for each group, as in the Working Party's Projection
BC

no withdrawals

Male, 30 Next Birthday at entry (in 1988)

Premiums are payable annually in advance

	<i>Term (years)</i>		
	5	15	25
Assumption 1	·86	1·93	2·50
Assumption 2	·70	1·58	2·17
Assumption 3	·50	·82	1·45

APPENDIX 1.2

Level Term Assurance

Male 30 Next Birthday (Smoker)

10 year term

Cover = 100,000 E.C.U.'s

<i>Country</i>	<i>Minimum Premium on offer (E.C.U.'s)</i>
U.K.	88
Ireland	129
Netherlands	164
Denmark	230
W. Germany	252
Spain	257
Belgium	325
Luxembourg	334
Italy	373
Greece	480
Portugal	900

(Some of these rates are for With-Profit policies)

Source: Bureau European des Unions de Consommateurs 3.3.1988

APPENDIX 1.3

Level Term Assurance

Net Premium Rates per £1,000 Sum Assured

Premium Basis:

interest rate = 6%

normal mortality = 80% of A67/70 select (2)

extra AIDS mortality—for each group, as in the Working Party's Projection
BCwithdrawals—5% p.a. within the Clear Group (no withdrawals within the
Non-Clear Groups)

Male 30 Next Birthday at entry (in 1988)

Premiums are payable annually in advance

	<i>Term (years)</i>		
	5	15	25
Assumption 1	·88	2·18	2·63
Assumption 2	·70	1·72	2·15
Assumption 3	·48	·72	1·06

APPENDIX 1.4

Level Term Assurance

Net Premium Rates per £1,000 Sum Assured

Premium Basis:

interest rate = 6%

normal mortality = 80% of A67/70 select (2)

extra AIDS mortality—for each group, as in the Working Party's Projection
BCwithdrawals—5% p.a. for the first five years, 8% p.a. thereafter within the
Clear Group (no withdrawals within the Non-Clear Groups)

Male 30 Next Birthday at entry (in 1988)

Premiums are payable annually in advance

	<i>Term (years)</i>		
	5	15	25
Assumption 1	·88	2·22	2·65
Assumption 2	·70	1·74	2·12
Assumption 3	·48	·69	·92

APPENDIX 1.5

Level Term Assurance (with options)

Net Premium Rates per £1,000 Sum Assured for a 15 year term

Premium Basis:

interest rate = 6%

normal mortality = 80% of A67/70 select (2)

extra AIDS mortality—for each group, as in the Working Party's Projectikon BC

no withdrawals

Male 30 Next Birthday at entry (in 1988)

Premiums are payable annually in advance

Option—to increase Sum Assured by 10% at both the 5th and the 10th policy anniversaries

—if the option is not effected at the 5th anniversary, it is not offered at the 10th anniversary

(a) Take-up rate applies to all groups

	<i>Take-up Rate</i>	
	50%	90%
Assumption 1	2.00	2.11
Assumption 2	1.66	1.75
Assumption 3	.86	.91

(b) Take-up rate applies only to members of the Clear Group (all of those policyholders within the Non-Clear Groups effect every option offered)

	<i>Take-up Rate</i>	
	50%	90%
Assumption 1	2.12	2.16
Assumption 2	1.72	1.77
Assumption 3	.86	.91

APPENDIX 2

With-Profits Endowment

Net Premium Rates per £1,000 Sum Assured

Premium Basis:

interest rate = 6%

normal mortality = 80% of A67/70 select (2)

extra AIDS mortality—for each group, as in the Working Party's Projection
BC

no withdrawals

bonus rate = 3.5%

Male 30 Next Birthday at entry (in 1988)

Premiums are payable annually in advance

	<i>Term (years)</i>		
	5	15	25
Assumption 1	199.04	68.79	42.18
Assumption 2	199.00	68.61	41.93
Assumption 3	198.95	68.29	41.39

APPENDIX 3

Level Term Assurance

Net Premium Reserves per £1,000 Sum Assured after 10 years

Reserving Basis:

interest rate = 5%

normal mortality = 100% of A67/70 ultimate

extra AIDS mortality—from Working Party's Projections A, BC and F

no withdrawals

Policy effected in 1978 for a 25 year term by a male aged 30 Next Birthday

Premiums are payable annually in advance

Net Premium (calculated on normal mortality only) = £1.94

<i>Projection Basis</i>	<i>Value of</i>		
	<i>Future Benefits</i>	<i>Future Net Premiums</i>	<i>Reserve</i>
No AIDS	35·463	20·819	14·644
F	42·784	20·750	22·034
BC	48·863	20·692	28·171
A	59·203	20·621	38·582