IMPACT OF HIV/AIDS ON DAMAGES CLAIMS

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ABSTRACT

This paper presents an actuarial approach to assessing the impact of HIV/AIDS on the calculation of damages claims. It suggests a method of computation that can be used in cases where lump sum awards are made in order to both illustrate the complexities involved and to stimulate discussion and thought. Finally, the paper concludes by suggesting the development of practical tables and models that could be used by practitioners in the field of damages claims.

It is noted that the approaches discussed in this paper have broader applications, in particular with regard to life insurance pricing.

KEYWORDS

HIV; AIDS; Damages for Lost Income; Sub-Population

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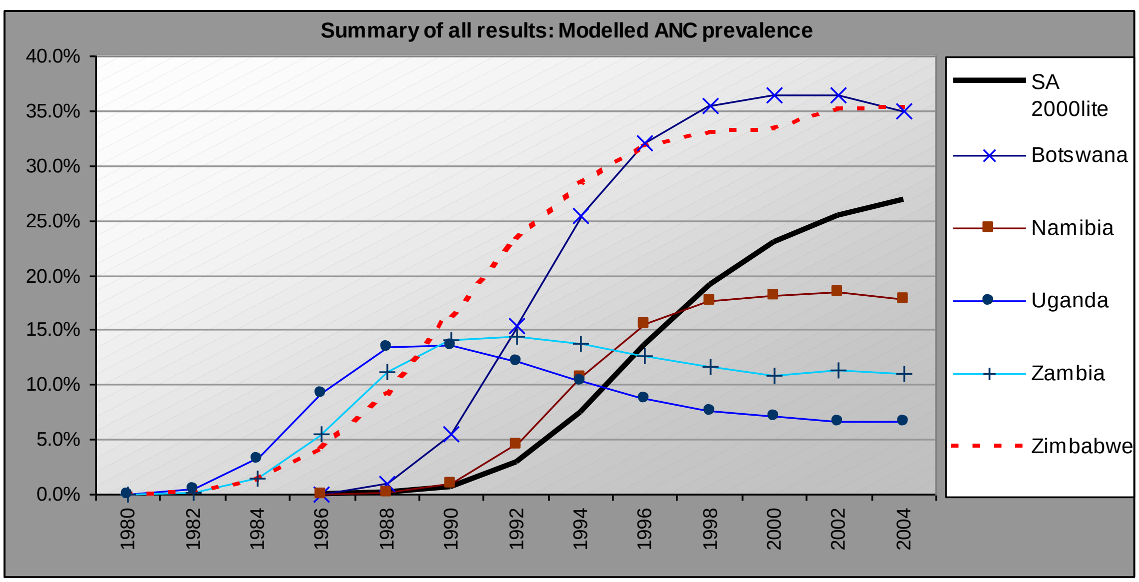
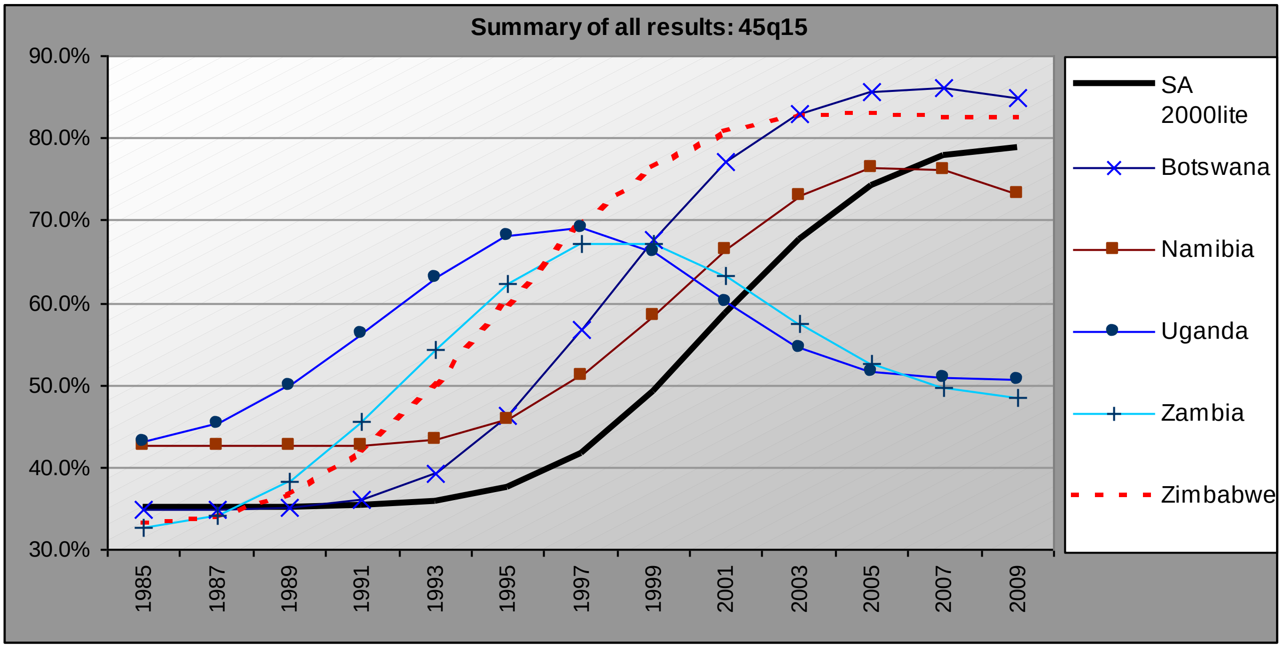
1. INTRODUCTION

Readers will be well aware of the significant reduction, due to AIDS, in the average life expectancy of people living in sub-Saharan Africa. This is dramatically illustrated in the charts shown below. The first shows current and projected HIV sero-prevalence levels for several sample countries (Dorrington & Schneider, 2001).



The second graph, which is more pertinent to a loss of earnings/support calculation, demonstrates the progression of ${}_{45}q_{15}$.



In South Africa $_{45}q_{15}$ currently stands at around 60% and is projected to increase to nearly 80% by 2010. This is in contrast to a pre-AIDS level of less than 35%.

Clearly AIDS has become part of our landscape. The HIV status of a claimant in a damages claim will have a significant impact on the claimant's future life expectancy. It is important that the actuary calculates an accurate life expectancy for the claimant and his/her dependents so that a realistic calculation of the quantum of the compensation can be made. However, this is easier said than done.

In most cases the HIV status of the affected party is not known. HIV testing is already a sensitive area and we cannot preclude the possibility of legislation being passed that disallows defendants from calling for them.

When the HIV status is known a whole range of complexities still need to be considered. For the HIV+ individual we need to estimate when infection took place in forming a view on future life expectancy. For the HIV- person there is still the chance of subsequent infection. It is at this point that the issues start becoming very complex and a number of models, some of which are described in the sections that follow, can be adapted to perform this calculation.

The most immediate problem with all of the models is that they represent, as does a life table, a statistical aggregation of observed mortality experience. In a damages claim we are dealing with a single individual (and possibly his/her dependents). There will always be significant error associated with ascribing an average to an individual. This becomes even more contentious with some of the models, such as those of the ASSA AIDS and demographic projection models, where the major determinant of infection is related to the sexual behaviour of the claimant.

Further subjectivity is introduced when considering that AIDS is an unfolding pandemic. There are features that we might well be able to model but we cannot predict if and when they might happen. Behaviour may well change and the extent to which the medical field is improving on anti-retroviral therapy, and vaccine trials may all suggest that our current assumptions relating to AIDS may prove to be inaccurate.

Depending on the model used, there might be further considerations not otherwise required. People who are handicapped as a result of an accident might in fact have a longer life expectancy than before the accident, due to a reduced ability to engage in risky sexual practices.

Notwithstanding these arguments it needs to be borne in mind that the courts to acknowledge the concept of an expected value in reaching decisions on awards that can be considered fair to both sides. (Koch, 1993).

Given all the difficulties we thought it would be informative to approach some of the actuarial practitioners in the field of SA damages claims to see the approach that they are following[1].

2. CURRENT PRACTICE

It would seem that most SA practitioners do not make an explicit allowance for AIDS in their calculations. This is not to say, however, that consideration has not been given to the issue. Some practitioners are comfortable that the contingency deduction sufficiently encompasses an AIDS allowance.

The argument was also put forward that even if the ASSA model was used to derive additional AIDS mortality loadings, then this loading might still be ignored due to the difficulty of leading evidence with regards to the sexual behaviour and hence the risk category of the claimant.

3. THE DEMISE OF LUMP SUM SETTLEMENTS ?

The arguments introduced by the HIV status of a claimant would be largely irrelevant in a legal sense if compensation for damages were payable by instalments. Currently the majority of compensation cases are settled by means of lump sum payments - instalments are only possible if both parties to the claim are in agreement.

The significance of HIV/AIDS on the size of compensation and the complexity in deriving appropriate loadings should add considerable weight to the arguments for the demise of lump sum settlements in favour of instalments. However, the odds against the adoption of a system of instalment payments are massive, not least because claimants (and lawyers) want lump sum payments.

Assuming continuance of the status quo it does seem inevitable that evidence on this issue will be introduced in damages litigation and that the actuarial profession will be called on to contribute to the debate. Judgment will be based upon arguments from a range of different disciplines and ultimately it is for the courts to decide how AIDS

[1] Some of their comments are included in Annexure B.

allowances are treated. We have produced this paper primarily to demonstrate the complexities involved and to stimulate discussion within the profession. For the large part we steer clear of legal argument and precedent and concentrate on a general mathematical model that can be applied to solving the difficult question of how long an individual can be expected to live given varying degrees of information.

4. DERIVING A GENERAL MODEL FOR THE CALCULATION OF THE EXTRA AIDS MORTALITY LOADING

4.1 <u>Overview</u>

Ideally one requires a model which is flexible enough to handle the projected extra AIDS mortality experience for an individual under a variety of personal circumstances. In particular the model should generate extra AIDS risk loadings which differ by age, gender, calendar year, country/province/whether the individual lives in an urban or rural center and risk group (which could be defined by income levels, race, intravenous drug usage etc). Another complexity that the model must handle, is the possibility that the individual has tested as being HIV negative at some point in the past.

One could attempt to adapt extra AIDS population mortality rates but such techniques do not handle the situation where an individual has already passed an HIV test (which is the typical situation for life offices offering significant levels of cover).

To overcome this concern one needs to model the probability of sero-converting each year ("Incidence Rates") and the length of survival from sero-conversion ("Survival Rates" or termination rates), in much the same way that PHI policies are priced. Furthermore, for the model to be worthwhile, one needs to allow for the paucity of data, and the practical difficulties of obtaining reliable data to calibrate the model.

4.2 <u>Practicality: calibrating the model</u>

Usually one derives a model, and calibrates the model at a later stage. However given the vast practical complexities of obtaining or deriving HIV data, the authors have started form the perspective of assessing what data is available.

By far the most reliable data relates to the sero-prevalence rate of pregnant women attending public ante-natal clinics[2] ("ANC data").

Unfortunately the ANC data which is used is also biased as the results are affected by the following factors (nonetheless this is currently the best dataset available):

- <u>Gender</u>: Quite clearly ANC data only captures pregnant women ignoring men, and as women are far more likely to sero-convert per sexual contact, ANC data

[2] Other possible sources of data are:

- Reported AIDS deaths, but these death statistics are notoriously unreliable, as cause of death is difficult to derive and in many countries (in Africa) reporting levels are very low.
- Sentinel data for comercial sex workers, men with STDs, TB patients at clinics etc are available, but each of these data sources are from a very biased sub-population group and are difficult to calibrate a statistical/demographic/epidemiological model to.

(especially early in the epidemic) over-estimates average adult prevalence levels. Ideally the model used should separate males from females.

- Public-Private Bias: most sentinel sites cover only public clinics, hence ANC data will produce flawed results if there are marked differences in HIV sero-prevalence by income levels, and the sampling technique used will be incomplete if few women make use of public clinics. In Africa most women do make use of public clinics, which reduces this risk.
- Contraception Bias: If citizens of the country are predominantly using condoms then the ANC data will over-estimate prevalence levels. However if non-barrier contraceptive methods are the contraception of choice then, then ANC data underestimates prevalence levels.
- Fertility bias: HIV+ females are likely to experience reduced fertility due to their compromised immune system (especially in ARC/Sick states). Hence ANC data underestimates prevalence levels in this regard. Ideally the chosen model should explicitly model this reduced fertility effect on women who sero-converted some time back.
- Age bias: ANC data overestimates prevalence levels for females aged 15-24 due to the increased risks of sero-conversion associated with economic pressures to engage in high risk behavior. More generally there is a bias both in young ages, since those that fall pregnant are obviously exposed to risk of infection, and in older ages owing to the impact of HIV on fertility. Ideally the chosen model should produce infection spread by age.
- Promiscuity Bias: with an increase the level of promiscuity, there is (possibly[3]) a greater chance of falling pregnant and hence sero-converting. Ideally any projection model should separately model individuals by behavioral risk groupings/classification.

4.3 Derivation of the model

Clearly the HIV sero-prevalence rate amongst women attending Ante Natal Clinics is given by the ratio: number of HIV+ women attending public Ante-Natal Clinics divided by the total number of women attending Ante-Natal Clinics (ie the sum of those that are HIV+ and HIV-).

If the epidemic started ***t*** years ago, and if we assume that non-AIDS mortality is independent of the individual's HIV status[4], then we derive the following equation, for the ANC prevalence rate at time ***t*** [5]:

[3] An exception may relate to commercial sex workers and individuals in very high behavioral risk groups, who may be more aware of the risks they face, or are economically motivated not to fall pregnant, and are hence more likely to make use of a variety of contraception techniques.

[4] Rosenburg, Johnson, Schneider and Dorrington (2000) correctly point out that this is assumption is incorrect, and could possibly be allowed for, by reducing the non-AIDS mortality rate.

[5] An adjustment is needed if $t > 15$ years. In this case one needs to derive Lx by considering the age specific fertility rate of women t years ago, the proportion of female births, the probability of a female infant being born HIV- and the probability that the HIV- female infant survives to age 15. This adjustment strongly suggests (in the mind of the authors) the need for a demographic model to be included in any population projection of HIV/AIDS, which spans a period in excess of 20 years, say. Note also that the formula given borrows heavily from work done by Simon Gregson (1998), Leigh Johnson (2000) and Salomon (2001).

$$\sum_{x=15}^{59} L_x \left\{ \frac{\int_0^t {}_r NI_x . i_{x-t+r} . S(t-r) dr}{\int_0^t {}_r NI_x . i_{x-t+r} . S(t-r) dr + {}_t NI_x} \right\} \Bigg/ \sum_{x=15}^{59} L_x$$

Where :

L_x	Is the number of pregnant women attending a public ante-natal clinic, aged ***x***
$S(t)$	is the probability that a person who sero-converted ***t*** years ago, is still alive
i_x	Is the force of sero-conversion at age ***x***
${}_t NI_x$	is the probability of <u>not</u> being infected with the HI Virus at time ***t*** for a women aged ***x***.

Hence ${}_t NI_x = e^{-\int_0^t i_{x+s} ds}$

In discrete time this equation can be expressed in a similar manner – however it is far simpler to modify the definition of the sero-conversion probability, which provides us with the following:

$$\sum_{x=15}^{59} L_x \left\{ \sum_{r=0}^{t-1} [I(x-t+r,r)][S(t-r-1/2)] \right\} \Bigg/ \sum_{x=15}^{59} L_x$$

where ***I(x,r)*** is the probability that a female (attending a public ante-natal clinic) aged ***x***, sero-converted in year ***r*** (which is taken as the number of sero-conversions divided by the number of females who were susceptible to sero-convert, ie the number of HIV- females).

And to derive the extra AIDS death rate (denoted as $q_{x,t,K}^{AIDS}$) for a life aged ***x***, one would difference survival probabilities, and derive the following equation:

$$\boxed{q_{x,t,K}^{AIDS} = \sum_{r=0}^{t-1} [I^K(x-t+r,r)].[S^K(t-r-1/2) - S^K(t-r+1/2)]}$$

Where

K	Represents the risk group of the individual or cohort in question (based on gender, income level, country, race, province, level of risk behaviour, occupation, class etc)
$[I^K(x,r)]$	Is the probability of a life aged ***x***, from risk group K who sero-converted in year ***r***.
$[S^K(t)]$	Represents the probability that a life aged ***x*** from risk group ***K*** survives ***t*** years

Clearly the above result could be used with any risk group (wealthy Asian males in Gauteng, commercial sex workers in Nairobi, etc) if one could obtain the appropriate incidence rates (the probability of sero-converting) and made use of an appropriate survival curve.

At this stage the formula only demonstrates that which is intuitively obvious: by assuming an independence between non-AIDS mortality and AIDS mortality, extra AIDS death rates can be expressed as a function of incidence rates (the probability of becoming HIV+) and termination rates (the probability of dying from AIDS). The benefit of explicitly specifying each of these parameters (as demonstrated in section 7 below) is that if we can obtain incidence rates for a specific risk group ***K*** *(which may need to be modified if we know the individual in question was tested negative for the HI Virus at some previous point in time)*, and then apply a modified survival curve (if necessary), we have the flexibility to derive extra AIDS loadings appropriate to the risk group in question. Furthermore if we wish to derive the proportion of members in risk group ***K*** who move into ARC state, become AIDS sick, start on an ART regime etc, one would have the flexibility to derive these rates using the above discrete-time model (Schneider, 1999 and Rosenberg, 2000) although care is needed with the application of the survival curves. This is thoroughly discussed in Rosenburg, 2000.

The next section of the paper comments on an appropriate population model which one could use to obtain appropriate incidence rates and (in section 6) how one could modify the incidence rates, and derive an appropriate survival curve.

5. *A Brief Overview of the HIV Sero-Prevalence Projection Models Currently Available*

In this section of the paper we highlight some common approaches which are used to model current HIV sero-prevalence levels (amongst pregnant women attending Ante Natal Clinics) and project these prevalence rates into the future. We also provide the reader with an explanation as to why we have decided to use the ASSA2000 suite of models, in our computation of the results presented in Section 7 of this paper.

The first type of model which was developed for projecting sero-prevalence levels was purely statistical/mathematical in nature and was developed by Jim Chin. This model assumes that incidence rates follow a Gamma distribution, and that survival rates follow a Weibull distribution. The user inputs the start of the distribution, a predetermined survival shape and the model then produces a best-fit to the prevalence data. The advantages of the method are that:

- it is easy to use,
- the model does not require large amounts of data (which is a very useful feature for modeling HIV prevalence levels in countries where data is sparse),
- for the purposes of our calculations such a model would be ideal as the incidence curve is explicitly specified in an algebraic form, and
- the model produces acceptable short term sero-prevalence estimates.

However, the disadvantages of the model include:

- it assumes sero-prevalence levels eventually fall to zero, due to the shape of the Gamma curve, which is counter-intuitive unless some form of world-wide intervention occurs;
- the model provides little direct insight as to the demography of the country in question over time, and it is hence very difficult to adjust the incidence rates derived for pregnant women to other risk groups, or even to derive incidence rates by age/gender. (As the resultant incidence curve represents an average curve for all pregnant women). DHS data and several studies (in particular) by Gregson have been used to adjust the incidence curves to reflect the average male and female incidence rates.

This is the model currently used by UNAIDS/WHO in deriving world-wide AIDS estimates (the model will be replaced in 2001/2 with the epidemiological model described below).

An improvement to Epimodel involved adjusting the Gamma curve in Epimodel to ensure that it doesn't tend to zero. 2 common techniques include adding a polynomial at some point to the incidence curve (personal discussions with H. Zlotnick of UNPOP) and recently Salamon & Murray (2001) have refined the technique further by allowing the incidence curve to level off at a factor of ∵ multiplied by the peak of the incidence curve. These results produce far more viable long term projections of future HIV sero-prevalences, but for our purposes we are again left with a lack of data relating to incidence for the individual's age, sex and risk group.

A further improvement involved replacing the Gamma curve (for incidences) and the Weibull curve (for survival) with a pure epidemiological structure (Grassly & Garnett, 2001). The latest UNAIDS/WHO model is defined by three differential equations which determine the change through time in the size of the not at-risk population *X,* the at-risk, susceptible population *Z*, and the infected population *Y*. The model has 4 parameters (the start date of the epidemic, the initial rate of spread, the fraction of the population at risk and the behavioral response of the population to AIDS). The advantage of this model is that the approach produces a very sound series of incidence curves (given by dY/dt) which are easily expressed in discrete time, fits prevalence data, and requires relatively little data in order to be run, but again the model does not provide sufficient age and gender related incidence output.

Ideally we require a model with a combined demographic and epidemiological framework, in which incidences rates are explicitly determined by age, gender and calendar year, and for which the ANC bias mentioned in section 4 of this paper is explicitly handled. To the best of the authors' knowledge three models meet these criteria, the US Census Bureau's iwgAIDS model, the Metropolitan Doyle model and the ASSA2000 series of models.

All 3 of the above mentioned models are complex in nature. The Doyle was removed from the selection criteria, as it is not available in the public domain, whilst the US Census Bureau's model is compiled and hence difficult to adapt. The ASSA2000 model is easily adjusted to give incidence rates, and combined with the authors familiarity with the model, and the fact that the model has just been calibrated for countries outside of SA (Dorrington & Schneider, 2001), this was the obvious choice for us. However, it is important to note that for the purpose of this calculation, there are acceptable alternatives.

6. DERIVING THE REQUIRED INCIDENCE AND SURVIVAL CURVES

6.1 Deriving the Incidence curve[6]. Here we discuss the methods that one could use to derive an appropriate incidence curve. Effectively the actuary would need to decide on the country, behavioral risk group combination which would be used to derive a population average incidence curve, and then possibly scale these incidence rates to reflect the claimants personal circumstances. Finally the derived incidence curve may need to be truncated (from the left) if we know the claimant was HIV- at some point in the past, and from the right if (for a loss of earnings computation) the accident removes the risk of future sero-conversion.

If the claimant was HIV+ as at the date of the accident (or sero-converted as a result of the accident), then there is no requirement to derive an incidence curve. One would still, however, need to estimate the claimant's future life expectancy (it is highly unlikely that one would know when the claimant sero-converted). This could be statistically calculated based on the claimant's CD4+ T-Cell Count, Viral Load and age. We would argue however that it is better to seek a medical opinion, as to the claimant's future life expectation, in the form of a medico-legal report in such cases.

If the claimant's HIV status as at the date of the accident is unknown then the incidence curve could be determined with reference to:

- Country, Province, Urban/Rural, Race: Incidence rates should be selected from a country calibrated projection model. Calibration is complex and care is needed. Comments relating to the calibration of the ASSA2000 range of models is outside of the scope of this paper but is discussed in Dorrington (1999, 2000 and 2001). For South Africa one should select a province specific calibrated model and possibly a race specific model - available online at the ASSA internet site[7]. For countries outside of SA we would recommend the ASSA2000 Urban-Rural Model (Dorrington & Schneider, 2001), which can be easily adapted to provide incidences for urban and rural centers separately. Here the Urban rates are more likely to be valid for the claimant given the nature of the calculation.
- Background: the 4 risk profiles used in the ASSA2000 model. The next question is, what weightings should one chose for the various behavioral risk groups? The ASSA2000 model currently divides the population into 4 broad behavioral groups PRO, STD, RSK and NOT (Dorrington, 1998). PRO represents the level of high risk behavior, represented by prostitutes and their clients. The proportion of the population in this behavioral risk category is usually around 1%-1.5% of the population. Proportions of the population with STDs (individuals who regularly have STD related symptoms) differ from country to country but generally lie in the 15%-25% range while the RSK group varies very widely by country but generally between 20% to 40%. The NOT group is assumed to never sero-convert and is the remainder.
- Choosing the behavioral risk profile. It is reasonable for one to select a weighting of the various risk groups in deriving the appropriate profile for the individual in question. If the individual is a prostitute then 100% of the weighting should be in the

[6] Prior to reading this section of the paper it would be useful for the reader to refer to Appendix A of the Rosenburg, Johnson, Schneider and Dorrington (2000) paper.

[7] Fortunately for South African actuaries, the ASSA AIDS committee (and Prof Dorrington in particular) has already calibrated the ASSA2000 range of models for SA, by province and race. But great care would be required for actuaries deriving an incidence curve outside of South Africa.

PRO group, an individual who has been repeatedly treated or has been regularly symptomatic with STD's the claimant would be represented with a 100% weighting in the STD group, whilst those who abstain from sex or never engage in unsafe sexual practices would have a 100% NOT weighting. Generally however, the authors feel that the weightings should follow those of the population[8].

- The effect of occupation and income levels on incidence rates. As we are computing the quantum of a loss of earnings/loss of support calculation the actuary would have full knowledge of the claimant's income and occupation. Generally as income levels rise, so HIV sero-prevalence levels fall[9], this arises as poorer individuals may have less access to health facilities for the treatment of STDs, and may be forced into working within the migrant labour system, and/or away from home. Judgment would be required by the actuary as to an appropriate scaling factor that should be applied to the population incidence level. Truck drivers, and soldiers, could possibly[10] require a factor greater than 100%. For most white collar occupations a scaling factor of 10% (executives, say) to 50% (clerical workers, say) is probably in the correct range.
- Truncating the incidence curves. If the actuary knows that the claimant is currently HIV- (or tested HIV- at some prior point in time) then it is obvious that the claimant has/had not sero-converted, but the claimant has the potential to become HIV+ in the future[11]. In this situation all sero-conversion rates prior to the date of the HIV test should be zeroised.
- The effect of the accident on future sero-conversion rates. If the claimant is permanently disabled, and as a result, his risk of future sero-conversion is extremely low, then for the claimant's mortality experience after the accident one would use a differing (lower extra AIDS) mortality curve post-the accident. Hence if the degree of disability is high and the country in question has a high sero-prevalence level, it is possible that the accident could improve the claimant's future earning's potential, as the accident no longer exposes the claimant to a mortality hazard!

6.2 Deriving the Survival Curve for an individual who has just sero-converted[12].

Here we discuss the considerations in deriving an appropriate survival curve.

We first consider the case where no antiretroviral therapy (ART) is initiated. The impact of the following factors on survival are considered:

- Age at time of sero-conversion. There have been numerous studies that show that age is strongly associated with AIDS mortality progression. Data for Africa is sparse but there is evidence from Uganda (Morgan, 1997) that show AIDS mortality rates

[8] This is controversial as the PRO group could very reasonably be excluded. If the PRO group is included in the same ratios as is used in the calibration of the ASSA models, then the resultant incidence curve represents the average sero-conversion rates of the population. However as we are using this computation to compute the loss of an individual's earnings/ loss of support to dependents, it is reasonable to assume that we know the individual's occupation.

[9] An obvious exception is where income/occupation provides the individual with a status in society and/or the ability to afford prostitutes, which in turn raises the risks of sero-converting.

[10] This comment is based solely on the authors' experience in Botswana which may not be appropriate for other countries.

[11] The task faced by the actuary is actually more complex, as one could easily argue that the fact that the claimant has not yet sero-converted, is a strong predictor that the claimant will not sero-convert in the future.

[12] Prior to reading this section of the paper it would be useful for the reader to refer to Appendix B of the Rosenburg, Johnson, Schneider and Dorrington (2000) paper.

rising significantly with increasing age. This can be translated to a median survival of 10 years for to an adult younger than 30 decreasing to +-9 years for an adult over the age of 35.

- Gender. There is conflicting evidence from studies investigating this effect. Given this uncertainty it would be reasonable to assume that the median survival parameter for males and females is the same.
- Race. There are a number of studies that suggest very strongly that race does not introduce any survival differences.
- Income, education and employment. Here studies again show mixed results. There is however a widely held view that survival does increase with higher socioeconomic levels due to factors such as improved nutrition, better general health and better social support networks. There is evidence that suggest populations with high tuberculosis prevalence levels, in turn related to income, have a shorter mean survival from HIV infection to death.

The Weibull distribution has been shown to be a good fit for the survival times in the three broad HIV stages. It is widely assumed that survival times in each stage are independent of one another. The table below summarises the median term to death and the shape parameters that may be used[13].

	HIV+ asymptomatic	HIV+ ARC	HIV+ AIDS sick
Median term to death	6.5 yrs	2.5 yrs	1.5 yrs
Weibull shape parameter	2.5	2.5	1

The effect of antiretroviral therapy on survival depends on three factors :

- The combination of ART drugs that the individual is treated with. There are three common treatments that increase in efficacy and price. Dual therapy is likely to be the most attractive combination for local medical schemes and the effect of this treatment can be modeled as a “backward move” into an asymptomatic state (Rosenberg, 2000). Or more accurately by a move into a new survival state. Triple therapy and HAART (Highly active antiretroviral therapy) are progressively more aggressive treatments that are available, but are more expensive.
- The stage at which ART is initiated. There are varying opinions as to when ART should be initiated and adjustments might be appropriate to survival time depending on this factor.
- Compliance with the treatment. Compliance can be very low with trials suggesting levels from 37% to 50%. Clearly compliance will impact on the survival benefit obtained from the treatment.

A difficult question arises as to whether or not the actuary should assume that ART is initiated. The availability and cost of these treatments must be a consideration. If treatment is state provided (Botswana has just announced plans to provide free ART from 1/1/2001) then it is reasonable to assume, notwithstanding the issues of compliance, that ART is initiated with a resulting increase in survival. In parts of the

[13] The shape parameters shown are those fitted by Gregson et al (1998) to data from a Ugandan study. The median terms were somewhat arbitrarily chosen

world (eg SA) where ART is not provided free of charge it would be reasonable to assume that high income earners would also initiate treatment.

It could be argued that the ensuing increased survival comes at a price and it is appropriate that this cost is deducted from the calculation of the claimant's future earnings had the claim event not occurred.

The real difficulty comes in for lower earners who would ordinarily not be able to afford treatment. The receipt of a lump sum as compensation for a damages claim might change this and result in an increased survival.

We believe that the cost of ART could be viewed as a tax item in the calculation of a loss of earnings. In that the HIV+ individual "purchases" an increased life expectancy, but as a result has less disposable income. Hence allowing for the increase in survival for HIV+ individuals (by assuming usage of an ART regime) could, result in a lower award than would be the case if no ART was assumed, as pre-accident disposable income would fall.

Thus two calculations should be made, with and without ART, and the higher amount chosen. In some sense this would mirror the economic choice that the claimant would have faced anyway had the claim event not occurred.

6.3 Issues specific to a Loss of Support computation

In addition to the items raised above, one needs to compute the probability of death of the surviving dependents of the deceased claimant. Two key concerns require discussion here:

1. the spouse's HIV status is dependent on the claimant's HIV status, and
2. children born of an HIV+ mother could be HIV+ and alive as at the date of accident, if they were born after the mother sero-converted[14].

6.3.1 Deriving the spouse's extra AIDS mortality loading

This can be calculated within the framework provided but requires a rather complex set of equations. More problematic is that they involve conditional parameters (such as those relating to incidence curves, sexual contacts – both within and outside of the marriage, probabilities of transmission), which would be very difficult to determine. As such the authors believe that the best way to proceed is to treat the spouse's extra AIDS loading independently, but to apply judgement to the assumed level of incidence given the circumstances of the case.

6.3.2 Deriving the extra AIDS mortality loading for children

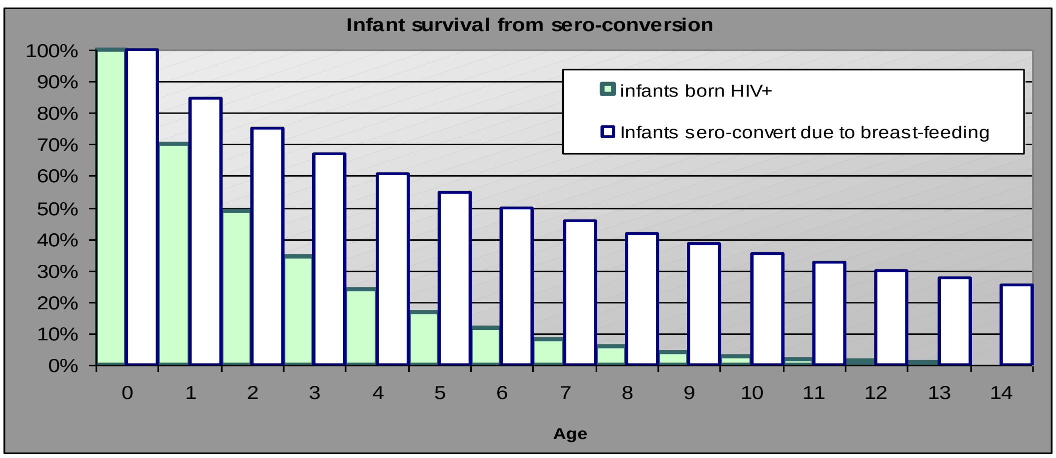
The extra AIDS mortality loading for teenagers is derived in the same manner as for adults (ie considering sero-conversion rates and survival curves). Infant children, however require special care.

[14] complicating this matter slightly is that the survival of an HIV+ child depends on how he/sho sero-converted, as infant survival follows a bi-modal distribution (children who sero-convert from the birth process die more rapidly than those who sero-convert from breastfeeding)

- If the child's age is ***a***;
- the probability of mother to child transmission (for a mother aged ***x***) as a result of the birth process, is given by ↦;
- the survival curve for children born HIV+ is given by $S^{\alpha}(t)$,
- the independent probability of transmission from mother to child due to breastfeeding is given by ↕;
- and the survival curve for children who sero-convert due to breastfeeding is given by $S^{\beta}(t)$,
- then the infant's extra AIDS mortality risk for the dependent child in year ***t*** is[15]:

$$q_{a,K,t}^{AIDS} = \left\{ \sum_{r=0}^{t-a-1} [I^K(x-t+r,r)].[S^K(t-a-r-1/2)] \right\}.[\alpha \{S^{\alpha}(a-0.5) - S^{\alpha}(a+0.5)\} + \beta \{S^{\beta}(a-0.5) - S^{\beta}(a+0.5)\}]$$

The survival curves for ↦ and ↕ are provided in the ASSA2000 model, and have been summarised in the curve below:



[15] The theoretical formula is more complex and depends on the viral load of the mother at the time of birth; whether she's received anti-retrovirals prior to the birth of her child; and there appears to be some empirical evidence to suggest that the manner in which infants are fed (whether bottle feeding is mixed with breast feeding) affects Beta. Both of these concerns can be handled by adjusting Alpha and Beta above.

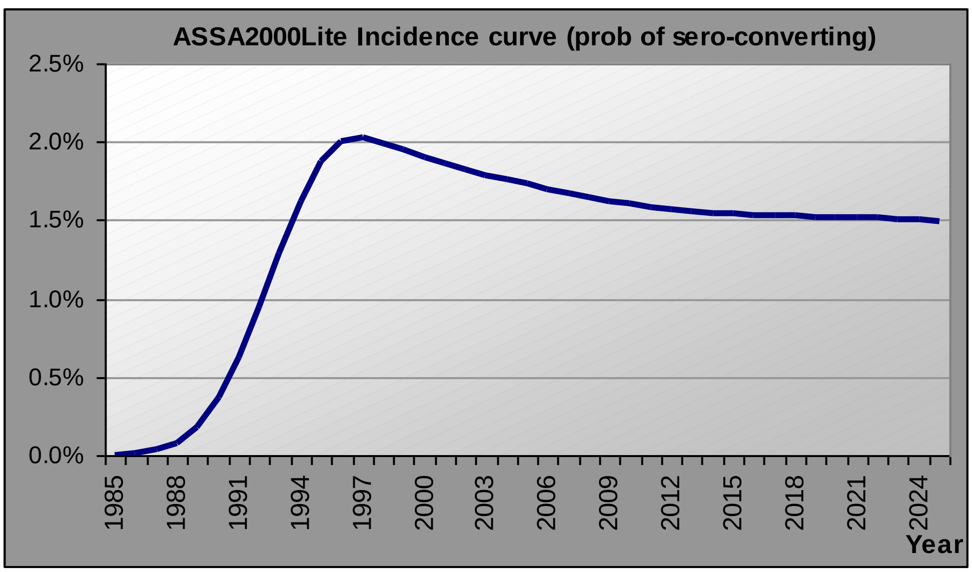
7. *EXAMPLE RESULTS*

For the purposes of this section we have chosen a hypothetical example. We have assumed that the claimant is a South African black male clerk aged 30 (at the date of the accident on the 30TH of June 2001) who earns R10,000 per annum. We have ignored:

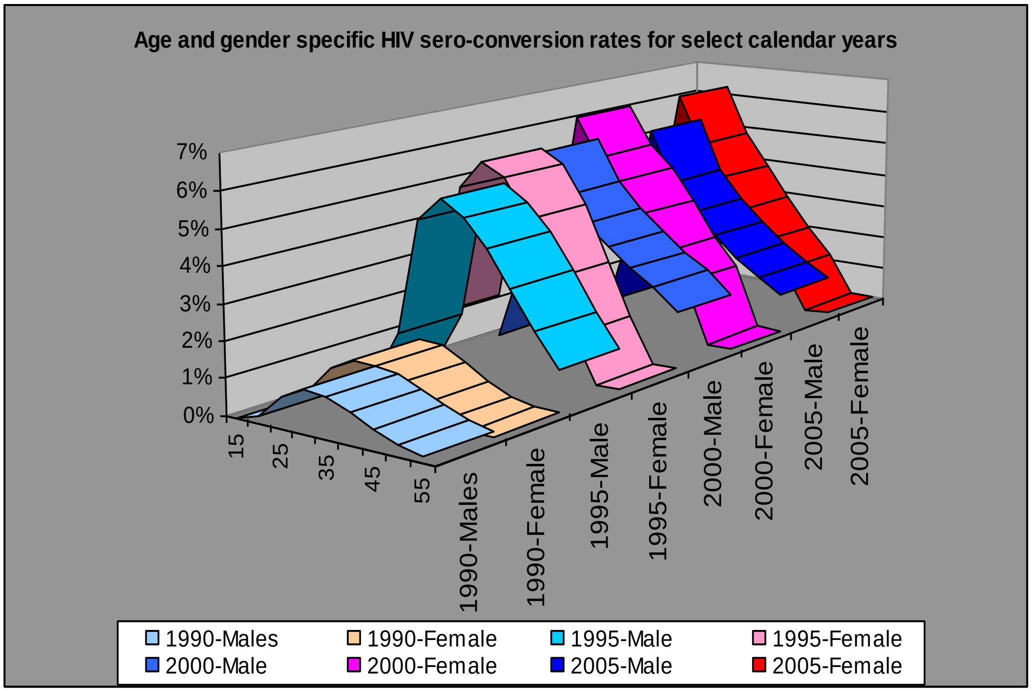
- SA tax rates,
- Overtime/bonuses,
- Future medical expenses.
- Any accrued losses between the date of accident and the date of the calculation

in our assessment of the value of his lost earnings, and his dependent's loss of Support claim (assuming the accident resulted in the death of the individual).

The first stage in our calculation was to run the ASSA2000Lite projection model (if we knew the province where the claimant lived and worked we could use one of the provincial models, but for demonstration purposes we have used a country-wide SA model). In view of the comments raised in Section 6 of this paper, we used the same behavioral weightings (PRO/STR/RSK/NOT) as provided in the calibrated model. The curve below summarises the incidence rates produced from that model:



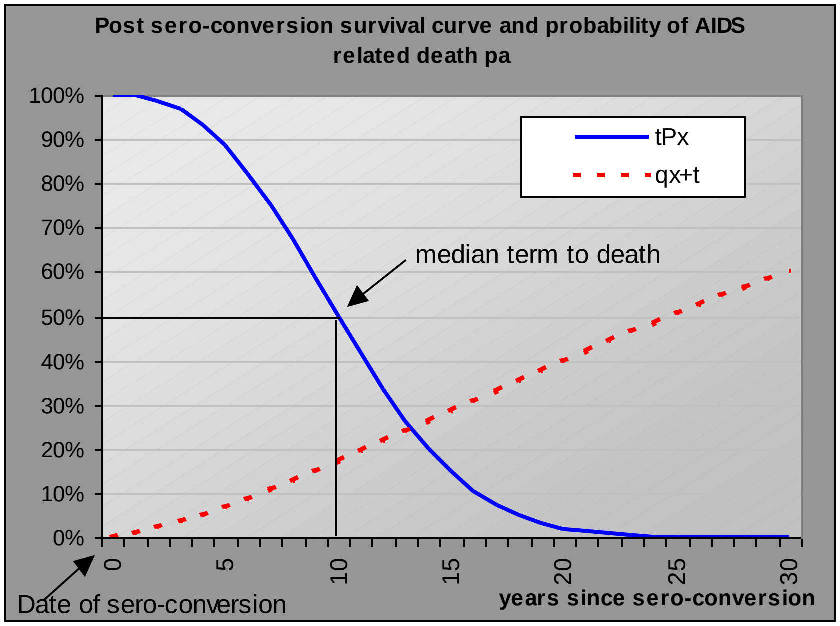
As mentioned in Section 5 of this paper, the key advantage of making use of the ASSA range of AIDS projection models is that not only can one derive the implied incidence curve for a specific country, but one automatically obtains age and gender specific incidence rates by calendar year, as demonstrated in the next curve:



These incidence rates will need to be scaled downwards to reflect the selective effect of income on this claimant's likely sero-prevalence level[16]. For the purposes of this calculation we have used a scaling factor of 25%. As mentioned in Section 6, factors between 50% and 15% would probably be in the correct general range for most employees, but the final factor requires judgment. For a loss of earnings computation the incidence rates may need to be truncated from the right if the accident results in the future sero-conversion risk of the claimant dropping to zero. (Of course, if the accident increases the sero-conversion risks, one could modify incidence upwards, from the date of the accident but this is an item for the Courts to decide)

The next stage involves consideration of the survival curves. In line with the comments raised in Section 6 of this report we have ignored the impact of Anti Retroviral Therapy (as doing so would have been non-optimal for the claimant), and we have used a Weibull distribution with a median term to death of 10 years (and a shape parameter of 2.5). This gives rise to the survival curve shown below:

[16] Herein lies one of the key complexities of applying an AIDS loading to a damages claim. Even though we are able to derive a statistically valid expectation of loss, the degree of uncertainty with regards to the claimant's expected sero-prevalence level is extremely high.

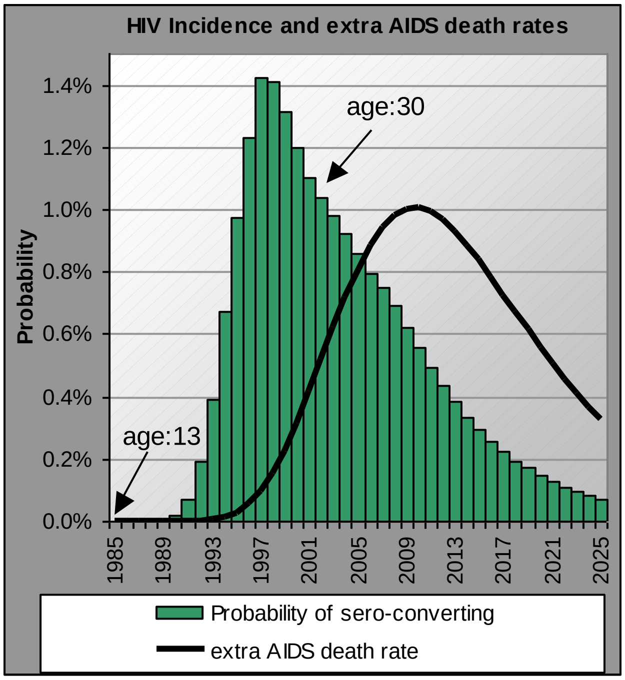


As can be seen in the graph, the median term to death is given as 10 years from sero-conversion, and the independent (see Section 4) probability of death from AIDS rises with increasing duration.

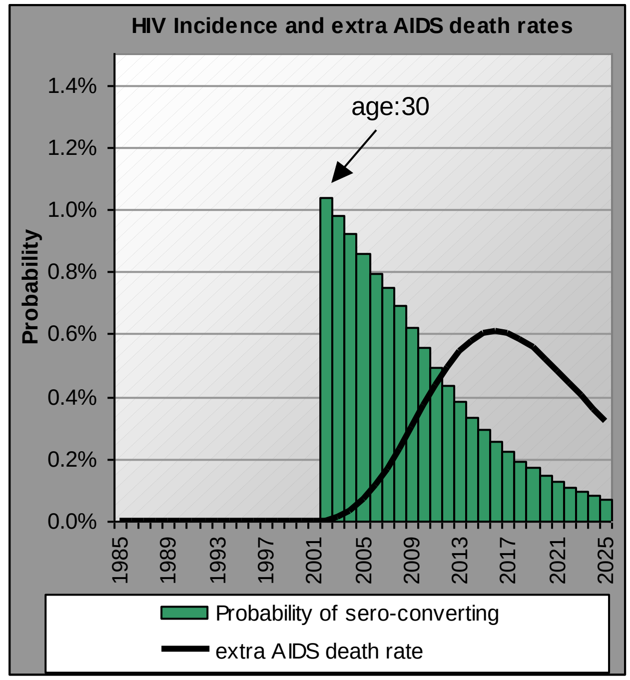
By combining the scaled incidence curve with the above survival curve, we obtain 2 differing extra AIDS risks. In the curve on the left, the extra AIDS risk is based on the assumption that the claimant could have been HIV+ before the accident, and can also sero-convert after the accident. For the curve on the right, we have re-run the computation on the basis that soon after the accident, the claimant demonstrated that he is HIV-[17]. Hence the extra AIDS risk applicable to the claimant relates only to the possibility that he can become HIV+ in the future.

[17] We have deferred the ethical arguments relating to the need for a victim of an accident being strongly encouraged to undergo an HIV test, and only submitting the test result if he/she tests negative.

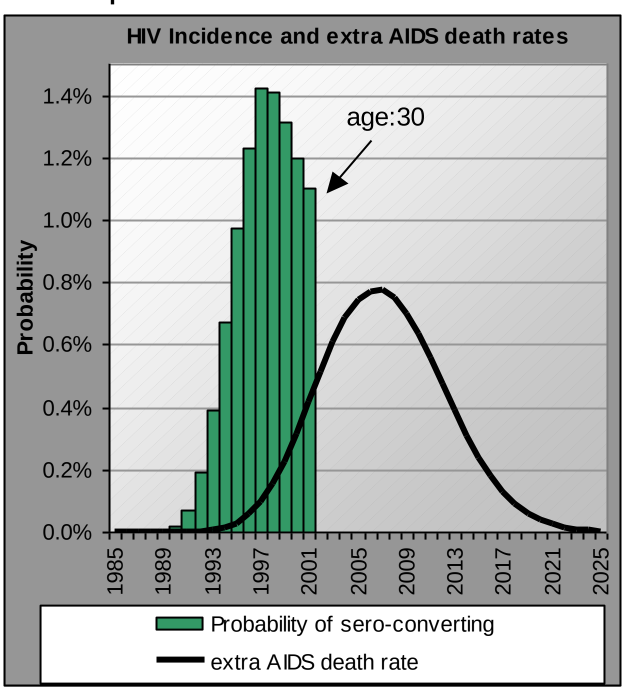
Case 1: 30 year old male clerk. Exposed to sero-conversion risks both before and after the accident



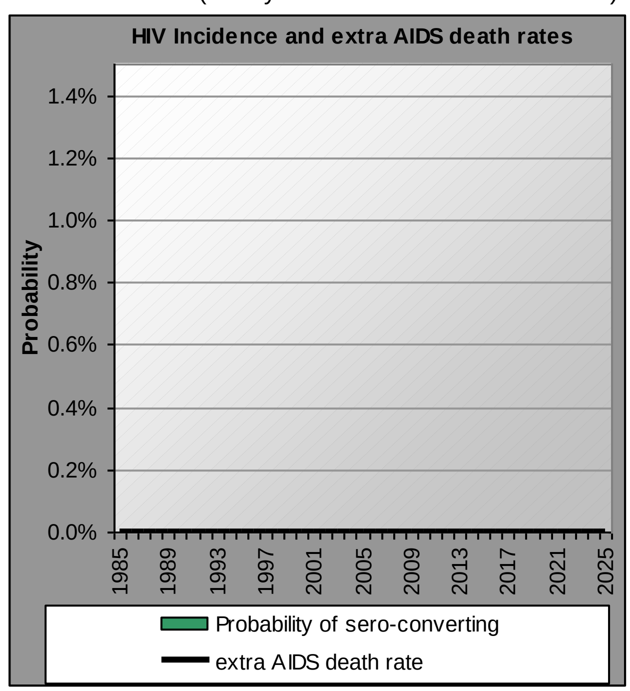
Case 2: 30 year old male. Provides an HIV- test result after the accident, but is still exposed to a future sero-conversion risk



Case 3: 30 year old male. Does not provides an HIV- test result, but as a result of the accident, he is no longer exposed to a future sero-conversion risk



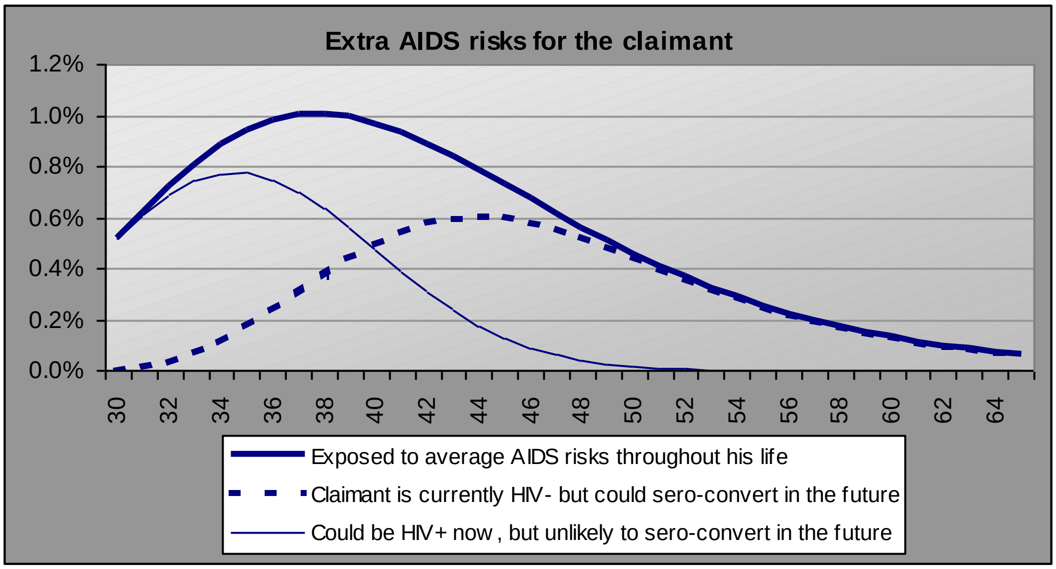
Case 4: 30 year old male Provides an HIV- test result after the accident, and is not exposed to a future sero-conversion risk (clearly the extra AIDS risk is now zero).



As can be seen in the above curves, the claimant's extra AIDS risk loading peaks at 1.0% in 2013, whilst if he is currently HIV-, his extra AIDS risk peaks at 0.6% in 2017.

7.1 Results of the loss of earnings/loss of support calculation:

Using the results of the previous section we were able derive expected extra AIDS death rates for the claimant under the 4 scenarios highlighted above (no AIDS exposure, an average AIDS exposure throughout his life, the claimant is HIV- now but can sero-convert and the claimant may be HIV+ now, but can't sero-convert in the future). These 4 curves are summarised below (obviously the zero AIDS case needn't be shown):



We made use of the following assumptions for the derivation of the loss of earnings for the claimant:

1. Consumer Price Inflation rate: 8% pa
2. Earnings inflation rate: 9% pa
3. Investment return: 11% pa
4. Expected earnings 12 months after the accident (had the accident not occurred): R10,000
5. Date of Accident: 31-December-2001. Date of Calculation: 1-January-2002.
6. Claimant's age at the date of accident: 30 exact
7. Degree of disability 100%,
8. non-AIDS mortality rate: SA85-90 (Coloureds)
9. Extra AIDS mortality allowance: 25% of ASSA2000Lite incidence rates, no behavioral bias, with a Weibull survival curve (median term 10 years, shape parameter 2.5)
10. Tax: a flat 5% deduction
11. Contingencies: a flat 20% deduction
12. The same life expectancy after the claim was used for both the "injured" and "uninjured" calculations

Results of the sample Loss of Earnings calculation:

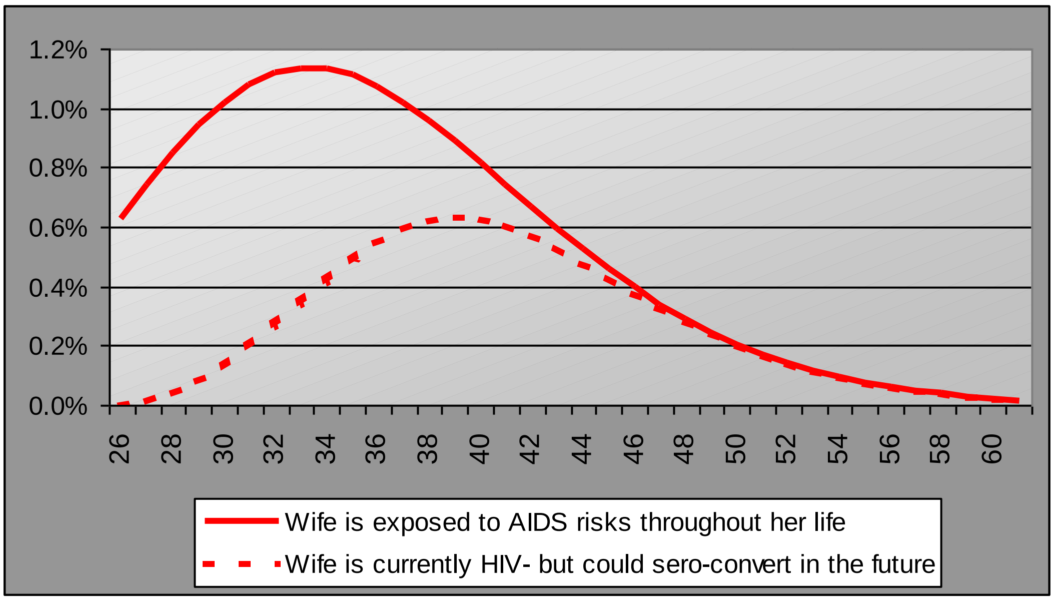
% of incidence ASSA2000Lite table	**25%**		**100%**	
Extra AIDS run	Value of prospective loss of earnings [18]	% change	Value of prospective loss of earnings	% change
Standard Mortality risks only -Zero AIDS allowance	158,839		158,839	
Average AIDS risks throughout life	142,950	-10%	106,330	-33%
Currently HIV- but can sero-convert in future	152,016	-4%	134,309	-15%
Could be HIV+, but unlikely to sero-convert in future	149,253	-6%	124,143	-22%

[18] Workings have been provided in the appendix

7.2 Results of the loss of support calculation:

Applying the identical example, but assuming the individual dies in the accident, and leaves a dependent spouse (aged 26 exact) only, who is unemployed and utilizes 50% of her husband's earnings. We have also allowed for a 3% rate of remarriage.

Firstly we ran the model specified in section 4 of the report (and not the dependent model in Section 6.4.1) to derive the following independent extra AIDS mortality risks:



From the above extra mortality rates, we derive the following table of results:

% of incidence ASSA2000Lite table	**25%**		**100%**	
Extra AIDS run	Value of prospective loss of earnings [19]	% change	Value of prospective loss of earnings	% change
Standard Mortality risks only -Zero AIDS allowance	72,553		72,553	
Husband and wife's HIV status unknown	58,811	-19%	34,378	-53%
Wife currently HIV-, husband's status was unknown at the date of the accident	62,894	-13%	43,238	-40%
Husband was known to be HIV- at the date of the accident. Wife's status unknown	62,367	-14%	41,934	-42%

[19] Workings have been provided in the appendix

8 WHERE TO FROM HERE…

If an actuary needs to calculate a lump sum damages award representing the present price substitute for a future income expectation then we hope to have demonstrated how a model can be employed to arrive at best estimates incorporating the effect of AIDS. The model presented makes allowance for particular features relating to the country-wide epidemic and the need to modify the incidence rates to reflect the claimant's personal circumstances.

In the view of the authors the complexities created by HIV/AIDS should lead to the consideration of instalment settlements, particularly in cases where agreement cannot be reached on the considerable levels of uncertainty.

It is perhaps with regard to the overall contingency deduction associated with most damages claims that the model could prove most useful. By and large this contingency makes general allowance for a number of factors, including an allowance for AIDS, and typically a flat deduction of between 10% and 30% is applied. The model could be used to better define the contingency deduction having regard to the circumstances of the client. The clerk example given suggests that the order of magnitude of the effect of AIDS is such that it could be reasonably incorporated into such a contingency framework. Of course this would mean that contingency deductions would now vary by age, gender, and calendar year. Tables could easily be produced that show levels of deduction that vary by broad factors that define the probable risk of the claimant.

There will however be cases where the effect of HIV/AIDS is too complex for it to be adequately handled using a contingency margin approach. In such cases the model would need to be actively invoked to fit the particulars of the claimant. Depending on the views of practitioners in this area it might be appropriate to develop a formal compiled model, under the auspices of the ASSA AIDS Sub-committee, to assist in such cases.

Such a model would also have applications in quantifying the liability to a defendant (for example a body such as the Road Traffic Accident Fund) in cases where instalment premiums are agreed to.

ACKNOWLEDGEMENTS

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APPENDIX A: WORKINGS SUPPORTING THE LOSS OF EARNINGS/SUPPORT CALCULATIONS

		Extra AIDS death rates			Husband's probability of survival				Economic Factors		Loss of Earnings Computation			
Male's age	Male Non-AIDS Prob of death	average AIDS risks throug life	currently HIV- but can sero-convert in future	could be HIV+, unlikely to sero-convert in future	Standard (non-AIDS) prob of survival	average AIDS risks through life	currently HIV- but can sero-convert in future	could be HIV+, unlikely to sero-convert in future	Gross Annual Expected Nominal Earnings	Disc-ount Factor	Standard (non-AIDS) loss of earnings	average AIDS risks through life	currently HIV- but can sero-convert in future	could be HIV+, unlikely to sero-convert in future
30	0.57%	0.52%	0.00%	0.52%	99.7%	99.5%	99.7%	99.5%	10,000	0.95	9,465	9,440	9,465	9,440
31	0.57%	0.62%	0.01%	0.61%	99.1%	98.3%	99.1%	98.3%	10,900	0.86	9,241	9,159	9,240	9,161
32	0.58%	0.72%	0.03%	0.69%	98.6%	97.0%	98.5%	97.0%	11,881	0.77	9,021	8,877	9,017	8,881
33	0.60%	0.81%	0.07%	0.74%	98.0%	95.6%	97.9%	95.7%	12,950	0.69	8,806	8,594	8,795	8,604
34	0.63%	0.88%	0.11%	0.77%	97.4%	94.2%	97.1%	94.4%	14,116	0.63	8,592	8,311	8,573	8,331
35	0.67%	0.94%	0.17%	0.77%	96.7%	92.7%	96.3%	93.0%	15,386	0.56	8,382	8,030	8,348	8,063
36	0.71%	0.98%	0.23%	0.75%	96.0%	91.1%	95.4%	91.7%	16,771	0.51	8,172	7,753	8,121	7,802
37	0.75%	1.00%	0.30%	0.70%	95.3%	89.5%	94.4%	90.3%	18,280	0.46	7,965	7,479	7,890	7,550
38	0.80%	1.01%	0.37%	0.63%	94.5%	87.9%	93.3%	89.0%	19,926	0.41	7,759	7,212	7,657	7,308
39	0.85%	0.99%	0.44%	0.56%	93.7%	86.3%	92.1%	87.8%	21,719	0.37	7,554	6,952	7,423	7,076
40	0.90%	0.97%	0.50%	0.47%	92.9%	84.7%	90.8%	86.6%	23,674	0.33	7,351	6,699	7,187	6,853
41	0.95%	0.93%	0.54%	0.39%	92.0%	83.1%	89.5%	85.4%	25,804	0.30	7,150	6,454	6,952	6,639
42	1.01%	0.89%	0.58%	0.31%	91.1%	81.5%	88.0%	84.3%	28,127	0.27	6,951	6,218	6,719	6,434
43	1.08%	0.84%	0.60%	0.24%	90.1%	79.9%	86.6%	83.2%	30,658	0.24	6,752	5,989	6,487	6,235
44	1.16%	0.78%	0.61%	0.18%	89.1%	78.4%	85.0%	82.1%	33,417	0.22	6,553	5,767	6,258	6,041
45	1.24%	0.73%	0.60%	0.13%	88.0%	76.8%	83.5%	81.0%	36,425	0.20	6,355	5,551	6,032	5,851
46	1.34%	0.67%	0.58%	0.09%	86.8%	75.3%	81.9%	79.8%	39,703	0.18	6,157	5,342	5,809	5,663
47	1.45%	0.61%	0.56%	0.06%	85.5%	73.7%	80.2%	78.6%	43,276	0.16	5,959	5,137	5,590	5,477
48	1.56%	0.56%	0.52%	0.04%	84.2%	72.2%	78.6%	77.4%	47,171	0.15	5,760	4,938	5,375	5,293
49	1.69%	0.51%	0.48%	0.02%	82.8%	70.6%	76.9%	76.0%	51,417	0.13	5,561	4,743	5,164	5,109
50	1.82%	0.46%	0.44%	0.01%	81.3%	69.0%	75.1%	74.6%	56,044	0.12	5,362	4,551	4,956	4,925
51	1.96%	0.41%	0.40%	0.01%	79.7%	67.3%	73.3%	73.2%	61,088	0.11	5,162	4,363	4,752	4,741
52	2.11%	0.37%	0.36%	0.00%	78.0%	65.7%	71.5%	71.6%	66,586	0.10	4,962	4,179	4,551	4,557
53	2.26%	0.33%	0.32%	0.00%	76.2%	64.0%	69.7%	70.0%	72,579	0.09	4,762	3,997	4,353	4,373
54	2.42%	0.29%	0.29%	0.00%	74.4%	62.2%	67.8%	68.3%	79,111	0.08	4,563	3,819	4,159	4,191
55	2.59%	0.25%	0.25%	0.00%	72.5%	60.5%	65.9%	66.5%	86,231	0.07	4,365	3,643	3,968	4,008
56	2.77%	0.22%	0.22%	0.00%	70.4%	58.7%	63.9%	64.7%	93,992	0.06	4,168	3,471	3,780	3,827
57	2.95%	0.20%	0.20%	0.00%	68.4%	56.8%	61.9%	62.8%	102,451	0.06	3,972	3,301	3,595	3,647
58	3.15%	0.17%	0.17%	0.00%	66.2%	54.9%	59.8%	60.8%	111,671	0.05	3,777	3,134	3,413	3,469
59	3.36%	0.15%	0.15%	0.00%	64.0%	53.0%	57.7%	58.8%	121,722	0.05	3,585	2,969	3,234	3,292
60	3.58%	0.13%	0.13%	0.00%	61.7%	51.0%	55.6%	56.7%	132,677	0.04	3,394	2,808	3,058	3,117
61	3.81%	0.11%	0.11%	0.00%	59.4%	49.0%	53.4%	54.5%	144,618	0.04	3,206	2,649	2,885	2,944
62	4.06%	0.10%	0.10%	0.00%	56.9%	47.0%	51.2%	52.3%	157,633	0.03	3,021	2,493	2,716	2,774
63	4.32%	0.08%	0.08%	0.00%	54.5%	44.9%	48.9%	50.0%	171,820	0.03	2,838	2,341	2,549	2,606
64	4.59%	0.07%	0.07%	0.00%	52.0%	42.8%	46.7%	47.7%	187,284	0.03	2,659	2,191	2,387	2,442
65	4.89%	0.06%	0.06%	0.00%	49.4%	40.7%	44.4%	45.4%	204,140	0.02	2,483	2,045	2,228	2,281
Total											**211,786**	**190,600**	**202,687**	**199,004**
Net of tax (5%) and contingencies (20%)											**158,839**	**142,950**	**152,016**	**149,253**

Wife's age	Female Non-AIDS Prob of death	extra AIDS death rates		Wife's Probability of survival			Joint Probabilities of death for loss of support calculation				Economic Factors	Loss of support calculation			
		average AIDS risks through life	currently HIV- but can sero-convert	Standard (non-AIDS) prob of survival	average AIDS risks through life	currently HIV- but can sero-convert in future	Standardie zero-AIDS risk allowed for	Both have full (BUT independent) exposure to AIDS	Husband full allowance, wife currently HIV-	Husband was HIV- at DoA, no data for wife	Wife's share. Nominal loss of support (Gross)	Standard Mortality risks only -Zero AIDS allowance	husband and wife's HIV status unknown	wife currently HIV-, husband's status unknown	Husband was known to be HIV-. Wife's status unknown
26	0.15%	0.6%	0.0%	99.9%	99.6%	99.9%	99.6%	99.1%	99.4%	99.3%	5,000	4,729	4,702	4,717	4,714
27	0.16%	0.7%	0.0%	99.8%	98.7%	99.8%	98.9%	97.0%	98.0%	97.9%	5,450	4,610	4,521	4,568	4,561
28	0.17%	0.8%	0.0%	99.6%	97.7%	99.5%	98.2%	94.8%	96.5%	96.3%	5,941	4,492	4,337	4,418	4,405
29	0.19%	0.9%	0.1%	99.4%	96.6%	99.3%	97.4%	92.4%	94.9%	94.5%	6,475	4,377	4,151	4,266	4,248
30	0.20%	1.0%	0.1%	99.2%	95.4%	98.9%	96.6%	89.9%	93.2%	92.7%	7,058	4,262	3,966	4,112	4,090
31	0.21%	1.1%	0.2%	99.0%	94.2%	98.5%	95.7%	87.3%	91.3%	90.7%	7,693	4,149	3,782	3,957	3,932
32	0.22%	1.1%	0.3%	98.8%	92.9%	98.1%	94.9%	84.7%	89.3%	88.7%	8,386	4,036	3,602	3,801	3,773
33	0.24%	1.1%	0.3%	98.5%	91.7%	97.5%	93.9%	82.0%	87.3%	86.5%	9,140	3,924	3,428	3,646	3,616
34	0.25%	1.1%	0.4%	98.3%	90.4%	96.8%	92.9%	79.4%	85.1%	84.3%	9,963	3,813	3,260	3,492	3,461
35	0.26%	1.1%	0.5%	98.0%	89.2%	96.1%	91.9%	76.9%	82.9%	82.1%	10,859	3,703	3,099	3,341	3,309
36	0.27%	1.1%	0.5%	97.8%	88.0%	95.3%	90.8%	74.5%	80.7%	79.9%	11,837	3,594	2,946	3,193	3,161
37	0.29%	1.0%	0.6%	97.5%	86.8%	94.5%	89.7%	72.1%	78.5%	77.7%	12,902	3,486	2,801	3,050	3,018
38	0.31%	1.0%	0.6%	97.2%	85.7%	93.6%	88.5%	69.8%	76.3%	75.5%	14,063	3,378	2,665	2,911	2,879
39	0.33%	0.9%	0.6%	96.9%	84.7%	92.7%	87.3%	67.7%	74.1%	73.3%	15,329	3,270	2,535	2,776	2,746
40	0.36%	0.8%	0.6%	96.5%	83.7%	91.8%	86.0%	65.6%	71.9%	71.1%	16,709	3,163	2,412	2,647	2,618
41	0.39%	0.7%	0.6%	96.2%	82.7%	90.9%	84.6%	63.5%	69.8%	69.0%	18,212	3,055	2,296	2,523	2,495
42	0.43%	0.7%	0.6%	95.7%	81.8%	90.0%	83.1%	61.6%	67.7%	67.0%	19,852	2,948	2,185	2,403	2,376
43	0.46%	0.6%	0.5%	95.3%	80.9%	89.1%	81.5%	59.7%	65.7%	64.9%	21,638	2,839	2,079	2,289	2,263
44	0.50%	0.5%	0.5%	94.8%	80.1%	88.2%	79.8%	57.8%	63.7%	62.9%	23,586	2,731	1,978	2,178	2,153
45	0.54%	0.5%	0.4%	94.3%	79.3%	87.4%	78.1%	56.0%	61.7%	61.0%	25,708	2,622	1,881	2,071	2,048
46	0.59%	0.4%	0.4%	93.8%	78.5%	86.5%	76.2%	54.2%	59.7%	59.0%	28,022	2,513	1,787	1,969	1,946
47	0.64%	0.3%	0.3%	93.2%	77.8%	85.7%	74.2%	52.4%	57.7%	57.0%	30,544	2,404	1,696	1,869	1,848
48	0.69%	0.3%	0.3%	92.5%	77.0%	84.8%	72.1%	50.6%	55.7%	55.1%	33,293	2,295	1,609	1,773	1,752
49	0.74%	0.2%	0.2%	91.8%	76.2%	84.0%	70.0%	48.8%	53.7%	53.1%	36,289	2,186	1,524	1,679	1,660
50	0.80%	0.2%	0.2%	91.1%	75.5%	83.2%	67.8%	47.0%	51.8%	51.2%	39,555	2,078	1,441	1,588	1,570
51	0.86%	0.2%	0.2%	90.3%	74.7%	82.3%	65.4%	45.2%	49.8%	49.2%	43,115	1,971	1,361	1,499	1,482
52	0.92%	0.1%	0.1%	89.5%	73.9%	81.4%	63.0%	43.4%	47.8%	47.2%	46,996	1,865	1,283	1,413	1,397
53	0.98%	0.1%	0.1%	88.6%	73.1%	80.5%	60.6%	41.5%	45.8%	45.2%	51,225	1,760	1,206	1,329	1,314
54	1.05%	0.1%	0.1%	87.7%	72.3%	79.6%	58.1%	39.7%	43.7%	43.2%	55,836	1,656	1,132	1,248	1,233
55	1.12%	0.1%	0.1%	86.7%	71.4%	78.7%	55.5%	37.8%	41.7%	41.2%	60,861	1,554	1,060	1,168	1,155
56	1.19%	0.1%	0.1%	85.7%	70.5%	77.7%	52.9%	36.0%	39.7%	39.2%	66,338	1,454	990	1,091	1,078
57	1.27%	0.0%	0.0%	84.6%	69.6%	76.7%	50.2%	34.1%	37.6%	37.2%	72,309	1,356	922	1,015	1,004
58	1.35%	0.0%	0.0%	83.4%	68.6%	75.6%	47.5%	32.2%	35.5%	35.1%	78,817	1,260	855	942	932
59	1.44%	0.0%	0.0%	82.2%	67.6%	74.5%	44.8%	30.4%	33.5%	33.1%	85,910	1,167	791	872	862
60	1.54%	0.0%	0.0%	81.0%	66.5%	73.3%	42.1%	28.5%	31.4%	31.0%	93,642	1,076	729	803	794
61	1.65%	0.0%	0.0%	79.6%	65.4%	72.1%	39.4%	26.6%	29.4%	29.0%	102,070	989	669	737	729
Total												**100,768**	**81,682**	**87,353**	**86,620**
Net of tax(5%), remarriage (3%) and contingencies (20%)												**72,553**	**58,811**	**62,894**	**62,367**

APPENDIX B: RESPONSES FROM QUESTIONNAIRE

The following question was put to a number of actuaries engaged in compensation claims for loss of income and loss of support :

> *We are writing a paper for the ASSA convention that considers how mortality assumptions used in the determination of third party claims might include an allowance for the effects of AIDS.*
>
> *Our interest in this topic stems principally from the mathematics and modeling involved. We would however like to get input from different people doing this work to see what the current practice is with regard to the consideration of HIV/AIDS in their calculations.*
>
> *We would be most grateful if you could share with us the approach that you are following as well as any other comments or views that you may wish to add.*

We would like to thank those who responded. A sample of some of the responses are shown below :

Respondent A :

"...Regarding third party claims, the topic of professional negligence is somewhat relevant to your study. If actuaries don't allow for AIDS, are they being negligent? What level of accuracy is expected from expert witnesses, especially when the end product is usually a bartering session between the parties. I asked a similar question of Robert Koch on the question of salary data - it can make a big difference to the claim if eg annual bonus or overtime is included in the victims earnings. What are the duties of the actuary in trying to elicit such information (when it can be difficult just to get names and dates of birth!) We cover ourselves by a statement along the lines that ' this calculation has been based on information supplied, and assumptions made which appear reasonable on the basis of such information. If it is considered that any information is incorrect, or assumptions inappropriate, then a recalculation should be made."

"…I would also list as one of the 'contingencies' that AIDS has not been taken into account."

Respondent B :

"...Obviously applying the AIDS model will depend on your assessment of the likelihood of a person being exposed to the risk of contracting the disease. This requires a future lifestyle evaluation as well as a state the risk category a person might be in is obviously difficult except when a person is HIV positive, this may be part of the reason why it is not explicitly allowed for.

Current practice is to allow for general contingencies, which are not clearly defined, but merely state an allowance for the possibility that the assumptions used may be incorrect. Again, a very difficult call which is often disputed by legal council and is generally shown for illustrative purposes."

Respondent C :

"...Up to now I did not have any indication that Aids /HIV infection was involved (legally). I think that the insistence to take the general Aids/HIV infection into account might come from the Road Accident Fund (South Africa). We received one enquiry recently but did not receive the specific brief. It was also related to damages suffered against the person responsible for "STD"."

Respondent D :

"…From a lawyer's point of view they want a credible opinion from an actuary as to how long the one individual before them will live, a life expectancy. If the individual already tests HIV positive the problem is fairly simple: Take life expectancy at 11 years at onset of HIV and then guess a bit at how long it has been there. One can argue a bit about the 11 years, but not much.

The more difficult one is the HIV negative claimant who is at risk for becoming HIV positive. The Actuarial society AIDS model defines certain risk groups. Life expectancy is substantially affected by the risk group (sex worker, for instance) into which the individual falls."

"…there is thus no alternative other than to argue the contentious issues and to lead evidence as to the sexual behaviour of the claimant."

"Nonetheless the obviously high risk claimant will turn up and the Court/lawyers will then need guidance on an appropriate loading for the extra mortality. For that rare instance the actuary needs to be prepared, and that is the area where your paper can make a most useful contribution."