The Changing Profile of HIV

Research shows a continuing improvement in mortality for HIV-infected individuals linked to improvements in medical diagnosis, monitoring and treatment. For life (re)insurers, medical advances alone warrant an underwriting rethink. But the story is more complex than that. Research has also shed much light on the contributory risk factors to HIV mortality. For example, there is now a much better understanding of the impacts of lifestyle, age and gender. With this information (re)insurers can implement a more refined risk assessment. In this article we review the individual threads that build up the full picture of HIV mortality and specifically how these factors manifest into medical underwriting at PartnerRe.

Global impact

It is estimated that over 40 million people have died from HIV infection since the global epidemic began and that approximately 33 million people worldwide are currently living with the virus[1]. The impact of HIV however varies markedly by continent and country (see **figure 1**), and also in terms of the groups at greatest risk of infection. For example, in the developed world less than 1% of the population has HIV; it is predominantly an urban disease afflicting young homosexual males (50% of all new U.K. HIV infections in 2010 were in this group[2]). The picture is radically different elsewhere. In Eastern Europe, injecting drug users and sex workers make up the majority of those infected. In Africa, most HIV transmission is via heterosexual sex and the disease disproportionately affects the female rural poor. The problem in the ten countries of Southern Africa is very severe: HIV prevalence rates here vary between approximately 15 and 25%[3], 34% of all HIV infected individuals and 40% of all infected adult women in the world live in Southern Africa.

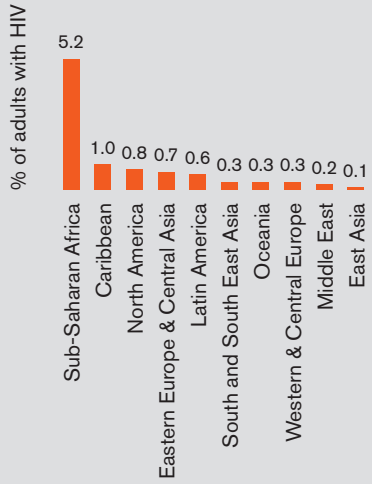

Figure 1: Percentage of adults (aged 15-49) living with HIV by world region. Source: UNAIDS[1] (2010)[3].

Human Immunodeficiency Virus (HIV)
HIV is a lentivirus (a slowly developing virus) and a retrovirus (its constituent biological matter is made up of RNA rather than the DNA in our cells). HIV hijacks white blood cells (specifically the CD4 T-lymphocyte cells) that defend us against infections. These infected cells become engines to replicate the virus which over time (*circa* 5-15 years) totally overwhelm the infected individual's immune system, making them prone to Acquired Immune Deficiency Syndrome (AIDS) defining illnesses. Antiretroviral treatments and recent pharmacological advances have concentrated on slowing or stopping this process.

AIDS defining illnesses include pneumocystitis pneumonia, kaposi's sarcoma, oesophageal candidiosis, toxoplasmosis of the brain and AIDS related cervical cancer, lymphoma and meningitis.

Life insurance approach

At the beginning of the pandemic, insurers, like governments and health care professionals, were unsure as to how virulent the disease would be. Premium rates for life insurance rocketed. By the 1990's rates softened in developed markets as the impact of HIV on overall population mortality turned out to be low. Underwriters then concentrated on identifying high risk individuals and declined HIV-positive applicants. By 2005, while the annual rate of new HIV infections in the developed world was continuing to grow, the annual number of AIDS diagnoses and deaths was falling. A new mortality risk factor had emerged prompting many to call for a rethink of the way that HIV risk was being underwritten.

Figure 2 shows the pattern of the HIV epidemic in the U.K., which is similar to that observed in most developed nations. HIV infections initially peaked in the mid 1980's, and AIDS diagnoses and AIDS related deaths slowly rose over time. After the introduction of antiretroviral treatment (referred to as ART or HAART) in the mid 1990's, the number of AIDS related deaths fell. Paradoxically however, HIV infection

1 The Joint United Nations Programme on HIV/AIDS (UNAIDS).
2 Health Protection Agency (HPA). HIV in the United Kingdom: 2011 report. London: Health Protection Services, Colindale, November 2011.
3 UNAIDS Report on the Global AIDS Epidemic, 2010.

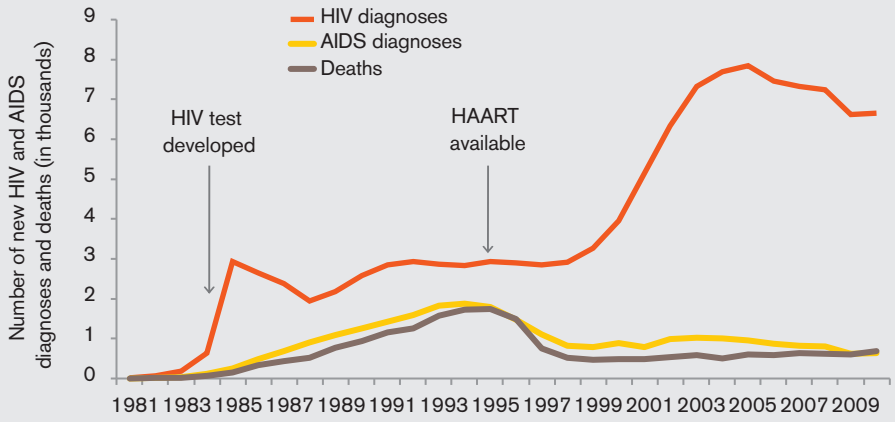

Figure 2: Annual new HIV and AIDS diagnoses and AIDS related deaths in the U.K. from 1981 to 2010. Source: HPA[2]. The positive impact of antiretroviral therapies on AIDS diagnoses and deaths can be seen from the mid 1990's. This is followed by a sharp increase in HIV infection rates from the late 1990's, possibly due to a reduction in the associated fear-factor given the availability and successes of ART.

rates then grew considerably, reaching a new peak in 2005. Commentators conclude that with the removal of the fear of immediate mortality, society has perhaps started to ignore the messages on "safe sex".

Antiretroviral treatment and emerging mortality trends

Antiretroviral treatment (ART), especially when used early, is responsible for the reduction in HIV patient mortality and usually involves at least three types of drug. Lohse (2007)[4], for example, showed that HIV positive patients diagnosed at age 25 (excluding those with Hepatitis C) and given ART had a median survival of 38.9 years. ART sustains the suppression of the virus in order for the immune system to be both preserved and in some instances to be restored. The efficacy of the treatment has been demonstrated in a raft of studies, which have also shed light on the role that other risk factors play in determining how effective the treatment will be, and thus on the overall mortality of HIV. Studies show that the success rate of ART on an individual is dependent on a number of factors:

- **Treatment compliance, viral load and CD4 count:** HIV affects the body primarily by attacking CD4 T cells, a type of white blood cell that is an essential line of defence for the body's immune system. ART aims to suppress the viral load, the amount of virus in the blood[5], to undetectable levels. In addition, evidence strongly indicates that a CD4 count[6] of greater than 500 c/mm^3 is the optimum level required to remain healthy. Constant monitoring of this and the viral load remains a vital part of any treatment regime.
- **Age and late commencement of treatment:** May (2011)[7] reported on a study of people whose CD4 at commencement of ART was less than 350c/mm^3. They concluded that ART life expectancy improved from 30.0 years (at age 20) in 1996-9 to 45.8 years in 2006-8, but that there was a significant impact on mortality if treatment was started later, particularly on those individuals whose CD4 had dropped below 200c/mm^3.
- **Gender:** More recent studies show a gender divide in terms of HIV life expectancy. HIV-infected females have a better overall life expectancy than males, however their mortality remains approximately 10 to15 times higher than non-HIV infected females. Even in female patients with optimum CD4 counts, mortality improvements have not been as dramatic as for their male counterparts. Researchers believe that the observed differences between the genders in fact relate to social class and wealth.
- **Lifestyle:** While the overall life expectancy of HIV patients is improving, they are still 3 to 15 times more likely to die than non-HIV individuals (Lohse 2007[8]) . It is apparent that non-HIV factors, particularly lifestyle, are playing a significant part:
  - Non-AIDS cancers, liver disease and cardiovascular disease are major causes of death.
  - Given that 50% of HIV patients are estimated to be smokers (Auld 2012[9]) and alcohol after Hepatitis is the major cause of liver disease, lifestyle plays a significant role and should be a factor in any underwriting decision.
  - ART itself appears to be lipogenic[10] and in the longer term can/will impact HIV patients through an increased risk of death from cardiovascular disease.

A new approach for HIV

PartnerRe's medical underwriters and life actuaries closely follow developments in the fields of medical research and social change, evaluating the impact of these developments on incidence rate and severity projections.

Over the last decade there have been amazing strides in both the understanding of the contributory risk factors that

4 Lohse, N et al. Survival of persons with and without HIV infection in Denmark, 1995-2005. Annals of Internal Medicine, 2007: 146, 2, 87-95.
5 Generally given as the number of HIV copies in a milliliter of blood; abbreviated to copies/ml.
6 The number of cells per cubic millimeter of blood; abbreviated to c/mm3.
7 May, M et al. Impact of late diagnosis and treatment on life expectancy in people with HIV-1: U.K. Collaborative HIV Cohort (UK CHIC) Study. BMJ Oct 2011:343: d6016.
8 Lohse, N et al. Improved survival in HIV-infected persons: consequences and perspectives. Journal of Antimicrobial Chemotherapy, 2007, 60, 461-463.
9 Auld, A.F. & Ellerbrock, T.V. Commentary: can mortality rates among adult antiretroviral therapy patients in Europe reach levels similar to those experienced in the general population? International Journal of Epidemiology, 2012.; 1-2.
10 The creation of fat modules which speed up atheroma, the disease process causing heart disease.

influence HIV and also in how the disease is managed and treated. The result is a dramatic improvement in the life expectancy of HIV infected individuals, an improvement that means that HIV is no longer unacceptable in terms of life insurance.

However the underwriting assessment of the disease remains complex; multiple risk factors are involved and their values and influences must be carefully considered. Based on our experience and research, PartnerRe has a defined approach to assessing HIV which takes into account these complexities alongside global demographic considerations. As an indicator of where we might position a start point for HIV risk assessment, the adjacent table summarizes our 'optimal control' HIV guideline measures for the U.K. and Ireland life markets.

If you are interested in finding out more about how PartnerRe assesses HIV and other life insurance risks, please contact our life underwriters for your respective market: www.partnerre.com/contacts.

PartnerRe's underwriting approach for HIV infected individuals, U.K. & Ireland

- No gender distinctions are made
- Applicants need to have 'optimum control' defined as:
  - Treated with ART for at least 1 year but no more than 10 years
  - Viral load < 1,000 copies/ml (or undetectable)
  - CD4 count never below 200c/mm^3
  - Last two CD4 counts maintained at > 500c/mm^3 with no major "blips"
  - No history of AIDS defining illnesses
  - No co-morbidities, such as Hepatitis C or B or tuberculosis
  - Be maintaining a healthy BMI
  - No history of intravenous drug use
- Policy restrictions & terms
  - Consider limiting maximum sum insured & term
  - Apply ratings within the range of 2-5 per thousand of sum insured.

Extended bibliography

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