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THE FINANCIAL IMPLICATIONS OF AIDS FOR LIFE INSURANCE COMPANIES IN THE UNITED STATES

TASK FORCE ON THE FINANCIAL IMPLICATIONS OF AIDS*

EXECUTIVE SUMMARY

The Committee on Valuation and Related Areas Task Force on the Financial Implication of AIDS was given the charge:

> to examine and report on the principles and techniques for the financial recognition of AIDS (Acquired Immunodeficiency Syndrome) by insurance companies, recognizing both statutory and GAAP accounting.

The scope of this charge included the examination of methods of reserving, consideration of the possible need for a new valuation table, and the role of the valuation actuary.

The objectives of the Task Force included:

- providing information useful in the assessment of the financial effect of AIDS,
- providing recommendations regarding the role of the valuation actuary in addressing the challenges created by AIDS, and
- evaluating alternative means of reserving for AIDS in statutory and GAAP financial statements.

The main focus of this report is the presentation of information and methodologies to support the analysis of the financial impact of AIDS on individual companies writing insurance in the U.S. This information is directed principally to the valuation actuary as he/she is professionally charged with the responsibility for analyzing the impact on the company and for recommending appropriate actions in response to AIDS. Since the role of the Society of Actuaries (SOA) and this Task Force is one of research and education, the findings of this report are not standards of practice. However, we hope our findings will be helpful to the Actuarial Standards Board as it defines standards of practice regarding AIDS.

The scope of the Task Force's research was limited to individual life insurance and individual disability insurance. This report addresses individual life insurance. Individual disability insurance is addressed in a separate report (see page 709).

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The Task Force coordinated its efforts with the Society of Actuaries Committee on HIV (Human Immunodeficiency Virus) Research and with the American Council of Life Insurance/Health Insurance Association of America (ACLI/HIAA) Ad Hoc Group on AIDS Data to produce new general population projections of AIDS infections, deaths and mortality rates by age and calendar year. The HIV Research Committee's report, entitled "U.S. General Population Projected AIDS Mortality Rates," is being released at this time as a companion report (see page 499). The ACLI/HIAA report on "Future AIDS-Related Life and Health Insurance Claims" was issued on March 1, 1989.

Conclusions

Nothing in this report should be a substitute for the valuation actuary's judgment regarding his/her own company's situation. This report can be a starting point for the valuation actuary's analysis. The valuation actuary should use any factors or methods he or she deems most appropriate.

1. The Task Force believes it is essential for all actuaries responsible for reserve valuations to evaluate the effect of AIDS on their companies. We recommend that these analyses include, at a minimum, development of estimates of the cost of AIDS and studies, using cash flow testing, of the adequacy of reserves in the face of AIDS. In the event that reserves need strengthening, it is appropriate that the actuary recommend to management the specific manner in which reserves should be established for AIDS. In addition, we believe it is desirable for actuaries to provide recommendations to management regarding the manner in which AIDS claims should be funded.
2. If the valuation actuary's analysis indicates that additional provision for AIDS is needed, the preferred method of providing for the future cost of AIDS in financial statements is in reserves, but if additional AIDS reserves are not maintained, the reasons for not so doing should be fully documented. Documentation could identify any allocation of surplus and plan of action for funding AIDS claims. Such plan of action might include changes to premiums, dividends or adjustable charges.
3. Based on information available at this time, the middle scenario of the report by the HIV Research Committee is the most plausible projection of general population AIDS mortality rates for examining the effects of AIDS on individual life insurance. However, the other scenarios presented in the report cannot be rejected as implausible. The valuation actuary may deem other scenarios to be appropriate as well.
4. Based on the ACLI/HIAA AIDS-Related Claims Surveys and the Task Force's intercompany study, AIDS mortality rates for individual life insurance typically are lower than those for the general population. Individual life insurance mortality rates can be approximated by multiplying the middle scenario general population AIDS

mortality rates by factors which account for the estimated difference between individual life insurance and general U.S. population AIDS mortality experience. The following factors are recommended by the Task Force:

- 40 percent for business (all untested) issued in 1983 and prior years
- 80 percent for untested business issued in 1984 and later years
- 60 percent for tested business issued in 1984 and later years. The AIDS mortality rates are first adjusted to exclude deaths resulting from infections prior to the year the business was tested for HIV infection.

We suggest a thorough reading of Section 2 before using these factors, in order to understand the derivation and limitations of the factors. As more experience becomes available, these factors can be updated. These factors should not be used when an individual company's experience is sufficient for development of its own factors.

5. It is appropriate that the valuation actuary consider additional adjustments to the above AIDS mortality rates to reflect differences due to geographical distribution of business, antiselection due to product line and underwriting characteristics, differences in expected lapses between HIV-infected and uninfected policyholders and other factors which the valuation actuary deems appropriate.
6. The Society of Actuaries is encouraged to continue its efforts to produce timely and detailed intercompany AIDS mortality studies in order to obtain AIDS mortality rates by issue age and policy duration. These data will allow more refined analyses than those provided in this report.
7. A new valuation table recognizing the impact of AIDS need not be constructed at this time. The marked variation in projected AIDS deaths by calendar year and geographical area and the insufficiency of the data, together with the long period needed to develop, gain approval of, and introduce a new table even if sufficient data were available, suggest that there are more effective and immediate means of providing for AIDS mortality at this time.

Acknowledgments

The Society of Actuaries Task Force on the Financial Implications of AIDS was formed in June 1988. The Task Force was formed under the auspices of the Committee on Valuation and Related Areas (COVARA). COVARA is chaired by Robert W. Stein and is under the supervision of SOA Vice President R. Stephen Radcliffe.

The Task Force is made up of the following members: Robert W. Beal, David J. Christianson (Chairperson), Harold J. Deutscher, Ardian C. Gill, William C. Koenig, Thomas W. Reese, and Paul E. Sarnoff.

In addition, several others made important contributions to the Task Force. These include the following persons from the SOA Committee on HIV Research: John B. Dinius, Walter H. Hoskins, Harry H. Panjer, Thomas W. Reese (Chairperson), and Harry A. Woodman (former Chairperson).

Several other important liaisons were established through the following: H. David Allen, Canadian Institute of Actuaries; Ted Becker, NAIC EX5 Life and Health Actuarial Task Force; Stephen A. Clairman, Canadian Institute of Actuaries; Robert J. LaLonde, American Academy of Actuaries Financial Reporting Principles Committee; John O. Montgomery, NAIC EX5 Life and Health Actuarial Task Force; and Anthony T. Spano, American Council of Life Insurance.

Other persons who made key contributions to the committee include: Jay D. Biehl, David M. Holland, Barbara J. Lautzenheiser, Robert W. Stein, and Jon K. Wilbur.

The significant efforts of all these people are greatly appreciated.

INTRODUCTION

The Task Force was appointed pursuant to a recommendation of the Report of the Society of Actuaries Task Force on AIDS, issued in March 1988 ("the Holland Committee") and reprinted in *TSA* XL, Part II (1988): 835–1159. The Task Force had the following charge:

> The charge of the SOA/COVARA AIDS Task Force is to examine and report on the principles and techniques for the financial recognition of AIDS by insurance companies, recognizing both statutory and GAAP accounting. Techniques may include both reserving and development of new valuation tables. The role of the valuation actuary is also to be considered. The purpose is to recommend actions to be taken by individual actuaries, regulators, actuarial organizations and other interested parties.

The Task Force reviewed existing materials and concluded that there was no need to present basic information describing AIDS and the AIDS epidemic. The major characteristics of the epidemic remain unchanged since the Holland Committee report was issued. Mortality rates due to AIDS continue to increase and no vaccines or cures have been made available. Thus, the Task Force has focused on the evaluation of the financial consequences of AIDS, leaving the readers of this report to obtain background knowledge and historical information on the epidemic from existing sources.

The Task Force considers this report, and the companion HIV Research Committee report, to be significant additions to the substantial body of previously completed AIDS research studies. In this regard, earlier analysis in the U.S. includes the Cowell and Hoskins paper, the Holland Committee

report, and the 1988 AIDS Symposium. In addition, Holland has since presented two important papers. In the United Kingdom, Bulletins 1 through 4 were issued by the Institute of Actuaries' AIDS Working Party. Finally, the Canadian Institute of Actuaries (CIA) has issued reports and guidance notes for valuation actuaries. Appendix 1 provides more information concerning the content of these studies.

This report applies specifically to the U.S. The research conducted by the Task Force was limited to individual life insurance, which is addressed herein, and individual disability insurance, which is addressed in a separate report. These product lines are of broad interest to the industry and, in most instances, provide more limited means than other lines of business to respond to changes in experience.

The need to study other lines was considered, but was rejected at this time. Group insurance is generally less susceptible to antiselection and has greater premium flexibility than individual insurance. Annuities have a relatively small risk of antiselection in the accumulation stage and none during payout. Long-term-care insurance is a concern if issued at younger ages, but is such a new product that analysis would be highly subjective at this juncture.

Medical expense coverage has obvious antiselection risk. However, the frequent availability of annual rate increases and the different nature of reserves made analysis a second order of business. (In addition, the Holland Committee report addressed medical expense coverages.) Credit insurance could be affected by significant antiselection, but financial implications would generally be short-term and could be corrected by marketing and underwriting procedures rather than by setting up long term reserves. Finally, reinsurance was considered. This line, along with other lines not specifically studied, will benefit from applying the information presented herein.

1. EFFECT OF AIDS ON INDIVIDUAL LIFE INSURANCE MORTALITY

1.1 AIDS Claims Related to AIDS Deaths in General Population

We conclude (in Section 2.3) that AIDS mortality rates for individual life insurance are generally lower than for the general population. Generally accepted reasons for this include underrepresentation among insured lives of major categories of reported AIDS deaths, namely, IV drug users and homosexuals/bisexuals, and underwriting that screens out those already infected.

On the other hand, reported death statistics at the company and industry level may understate AIDS deaths among insured lives. Deaths among insured lives may not be identified as AIDS claims, either as a result of not investigating incontestable claims or from inadequate information on the claim form and death certificate.

The AIDS-Related Claims Survey of the American Council of Life Insurance (ACLI) and the Health Insurance Association of America (HIAA) dated February 10, 1989 indicated that ordinary life insurance AIDS claims (by amount) were 0.9 percent of total claims for 1986 and 1.2 percent for 1987. This 33 percent increase is only about one-half of the nearly 60 percent increase in general population AIDS deaths from 1986 to 1987. The Task Force believes that this smaller increase in the occurrence of AIDS, which may represent only a temporary flattening of the rate of AIDS claims, may be attributed to faster rates of progression from infection to AIDS among IV drug users. It is also possible that HIV-infected insured lives may have greater access to AZT and other medical treatments which prolong the lives of people with AIDS.

Therefore, the Task Force believes that emerging life insurance claims will increase in a similar manner as projected for the general population, although at a lower level. According to the projections of the Committee on HIV Research, deaths from AIDS will be 4 to 12 times 1987 annual levels by the late 1990s.

Finally, the ACLI/HIAA Survey indicated that the financial impact of individual life insurance AIDS claims varied significantly among companies based on the ratio of AIDS-related claims to total claims for 1987. The following table displays the extent of company variation and indicates the need for each company to analyze its own experience:

Ratio of AIDS-Related Claims to Total Claims	Percentage of Companies
Under 1%	58.7%
1% to 2%	27.0
2% to 3%	7.5
3% and over	6.8

1.2 AIDS Deaths Related to Other Causes of Death

While the male death rates from cancer, accidents and violence, and heart disease are decreasing, AIDS mortality rates are expected to increase in the

years ahead. Even if the male death rates from the leading causes do not continue to decrease, but instead remain at 1986 levels, male AIDS mortality rates are projected to individually surpass these death rates by the year 1995 for ages 25–44. This will occur even sooner if the current decreasing trend in death rates for other causes of death continues.

LEADING CAUSES OF DEATH CURRENT AND PROJECTED

Cause of Death	Year	Death Rates per Thousand (Males)		
		Ages 25–34	Ages 35–44	Ages 45–54
Heart Disease	1986	0.118	0.580	2.214
Cancer	1986	0.134	0.408	1.710
Accidents and Violence*	1986	1.153	0.907	0.858
AIDS	1986	0.154	0.177	0.107
AIDS	1990	0.613	0.628	0.392
AIDS	1995	1.333	1.137	0.637
AIDS	2000	1.718	1.238	0.615

*Accidents, homicides and suicides.
Note: Source of AIDS death rates is middle scenario, general population. AIDS death rates are reported based on central ages of 30, 40 and 49. Source of other death rates is *Statistical Abstract of the U.S.*, 1989, p. 82–83. Death rates for accidents and violence are derived from the tables on page 83, adjusted by weighted average of black and white age adjusted population.

For male ages 25–34, the 1986 AIDS mortality rate is already greater than that of cancer and heart disease, and this also is expected to be true for ages 35–44 by 1990. For both of these age groups, AIDS is projected to become the leading cause of death for males by the year 2000.

1.3 Mortality Margins in Current Valuation Tables

The Committee on Valuation and Related Areas opined in 1987 that, in the aggregate, the tabular costs produced by the 1980 CSO table(s) should exceed actual mortality costs, including AIDS. However, little comfort can be taken from this broad statement without an understanding of each particular company's characteristics and a recognition of persistency differentials between HIV-infected insureds and others.

First, a company's mortality margins are directly dependent on its level of mortality experienced, which varies widely based on underwriting and other considerations. Similarly, while overall tabular costs may exceed actual

mortality costs, this may not be true for all ages. The Task Force has concluded that only company management can assess the extent to which mortality margins from one age are available (or can be made available) to pay claims at other ages.

Also, since the standard valuation law does not make explicit provision for expenses, it implicitly assumes that other reserve elements (for example, interest or mortality) are sufficiently conservative to cover expenses when gross premiums approach minimum valuation net premiums. The ability to recover expenses from mortality margins is reduced given the certainty of extra AIDS deaths.

A significant factor in the analysis of a company's mortality margins is the estimated change, over time, in the relative sizes of the infected and uninfected groups in an insured population. Such change is due largely to the expected lapses among insureds not infected and not at risk, compared to those infected or at risk. That is, the HIV-positive segment will be growing in number and proportion, while the number and proportion of uninfected individuals will be declining. In five years, the middle scenario of the HIV Research Committee report projects the number of HIV-positive individuals to have increased by 30 percent. If the uninfected segment experiences a 10 percent annual lapse rate, this factor alone will reduce its size by 40 percent. More specifically, a Task Force model for male age 25 shows that under these assumptions, lapse, mortality and transfer to the infected group reduce the uninfected segment to about 57 percent of its original size in five years. Mortality margins per thousand are thus 43 percent less than at the outset, assuming perfect persistency among the infected group. Different persistency assumptions for the infected and uninfected groups would yield different results, but the effect is clear.

The Task Force has concluded that no general statement of assurance can be given regarding the margins inherent in the present valuation mortality table. There is no substitute for a thorough analysis of a company's potential extra AIDS mortality (as facilitated by the discussions within this report), plus a full understanding of current and expected non-AIDS company mortality experience. A gross premium valuation, with emphasis on annual cash flows, will demonstrate the extent to which AIDS claims may or may not be absorbed by existing margins.

1.4 AIDS Mortality Studies of Individual Life Insurance Experience

Companies contributing data to the SOA annual studies of individual life insurance mortality experience have been requested to show AIDS as a

specific cause of death. This will provide data needed for calculations of AIDS mortality rates by sex, issue age and duration and will greatly improve on the approximate methods of calculating AIDS mortality rates that have been used in this report. Companies will be asked to indicate state of residence so that geographical breakdowns can be obtained. These studies will be particularly helpful in determining the effect of (1) antiselection on 1984 and later issues, (2) testing for HIV infection, and (3) selection through regular underwriting.

The Task Force recommends that steps be taken by the Individual Life Insurance Experience Studies Committee to speed up the process of collecting, compiling and presenting data on AIDS mortality rates so that the data are made available on a more timely basis. The HIV Research Committee has a specific interest in the collection of these data and may be able to assist. Additional companies should be urged to contribute data, at least on their AIDS experience, to these SOA annual studies so that a more complete cross-section of experience by size and geographical area of company can be obtained. Separation of experience by HIV-tested and untested business is also needed.

The Task Force also recommends that general population data on AIDS deaths continue to be collected and analyzed so that the mortality rates used in this respect can be updated as necessary. These ongoing analyses should be performed in sufficient detail so as to separately analyze the emerging impact of the AIDS epidemic on male and female lives. In addition, data should be accumulated so as to permit a continuing evaluation of the geographical variations presently noted in AIDS mortality experience in the general population and insured data.

Finally, the Task Force recognizes that the industry will eventually require an updated statutory valuation mortality table to be used for individual life insurance. To support the appropriate development of the next valuation mortality table, the Task Force recognizes that the efforts of the Society of Actuaries to gather detailed and timely intercompany data through a standing committee are important. In this regard, the Task Force recognizes that AIDS mortality and morbidity experience is likely to vary considerably from year to year. Adjustments to mortality data will likely be needed, depending on the course the AIDS epidemic takes, to reflect the appropriate underlying mortality in the valuation table.

2. A METHOD FOR DEVELOPMENT OF AIDS MORTALITY RATES

This section describes the methodology used by the Task Force to develop AIDS mortality rates for insured lives. First, a general population model was selected to project AIDS cases and deaths throughout the next several decades. From the model, population AIDS mortality rates were developed by relating population AIDS deaths to appropriate population bases. Mortality rates for insured lives were then obtained from the general population mortality rates by applying adjustment factors designed to reflect the insured life/general population mortality relationships experienced to date. Finally, adjustments for geographical differences, as well as for antiselection by product and underwriting differences, are suggested.

A proposed methodology for estimating AIDS mortality rates for individual life insurance, with adjustments for geographical and other company differences, is a primary feature of this report. However, the Task Force recognizes that more specific insured lives information is needed concerning AIDS mortality experience in order to make more accurate mortality projections.

2.1 The Population Model

A starting point for analyzing the financial impact of AIDS is to estimate the future course of the AIDS epidemic. To that end, a general population model of AIDS infections, cases and deaths was developed through a combined effort of this Task Force, the SOA Committee on HIV Research, and the ACLI/HIAA Ad Hoc Group on AIDS Data. The model, containing low, middle and high scenarios, is presented and analyzed in a companion report entitled "U.S. General Population Projected AIDS Mortality Rates," prepared by the SOA Committee on HIV Research (see page 000).

The development of this general population model is a significant achievement. Those who contributed to this effort, particularly Thomas Reese and John Dinius, are to be commended for the excellent research done in preparing this population model.

The Task Force believes that the middle scenario of the aforementioned general population model represents the most plausible basis for developing mortality assumptions to be used in examining the financial impact of AIDS on an insurance company. Given the range of projections available, it appears to be neither pessimistic nor optimistic and is consistent with the data and projections of the U.S. Centers for Disease Control (CDC). Other scenarios may be plausible as well.

The model is completely explained and documented in the companion report of the HIV Research Committee. Certain key data from that report have been extracted and are included herein to assist in understanding the process adopted by the Task Force.

Tables 1, 2 and 3 show annual HIV infections, AIDS cases and AIDS deaths, respectively. These tables compare the middle scenario to the high and low scenarios as well as to two Cowell/Hoskins projections. In Table 2, a comparison also is made to the CDC projection, which indicates that the middle scenario closely tracks the CDC projection. However, beginning in 1988 the middle scenario has lower, rapidly diverging modeled infections compared to the Cowell/Hoskins projections. This divergence results in lower cumulative cases than Cowell/Hoskins beginning in 1992 and lower cumulative deaths beginning in 1990. The main reason for the difference, according to the HIV Research Committee report is due to "new observations in the history of AIDS cases and revisions in CDC projections."

Table 4 displays AIDS deaths classified by year of infection. Year of infection categories are presented for all years combined prior to 1986, for each year from 1986 through 1990, and for combined years 1991 and subsequent. This classification of deaths can be used by the actuary to tailor financial analyses to an individual company, as described more fully in Section 2.5.

2.2 Derivation of General Population Mortality Rates

From this general population model, AIDS mortality rates were derived by the HIV Research Committee. (Appendix A of the HIV Research Committee's report provides male rates, and Appendix D provides female rates.) Table 5 shows male mortality rates based on this general population model (middle scenario) for infections from all years. Note that these mortality rates are a function not only of age, but also of calendar year. AIDS mortality rates increase by calendar year for several years due to the increasing yearly level of infection and the relatively long progression from infection to AIDS. Mortality rates then begin to decrease by calendar year due to the saturation of the high-risk population. These AIDS mortality rates are "add-on" death rates to general population death rates from all other causes.

TABLE 1

COMPARISON OF MODELED ANNUAL HIV INFECTIONS

	SOA Committe on HIV Research			Cowell/Hoskins	
Year	Low	Middle	High	Infection Declines	Infection Continues
1975	0	0	0	0	0
1976	533	373	746	391	391
1977	1,293	1,302	2,542	1,383	1,383
1978	2,839	3,819	7,886	4,124	4,124
1979	6,511	9,945	21,973	10,284	10,284
1980	14,738	23,083	56,051	21,609	21,609
1981	32,807	47,190	119,568	38,396	38,396
1982	71,249	91,624	212,800	59,129	59,129
1983	100,904	152,215	251,191	82,744	82,744
1984	129,573	181,803	264,988	110,032	110,032
1985	123,949	166,097	257,148	149,488	149,488
1986	101,784	139,431	246,954	192,926	192,926
1987	79,119	123,252	237,593	248,947	248,947
1988	47,335	104,395	227,285	271,873	304,623
1989	33,401	95,234	214,782	273,764	349,432
1990	20,861	87,475	202,271	256,127	372,330
1991	12,477	75,233	191,020	224,621	366,809
1992	6,296	64,021	181,461	185,908	334,492
1993	3,796	60,904	169,287	145,283	284,197
1994	3,174	56,478	155,283	105,836	227,313
1995	2,546	52,639	140,246	68,714	173,190
1996	1,914	49,496	124,901	33,741	127,130
1997	1,278	46,165	109,854	0	90,791
1998	639	44,626	95,563	0	63,576
1999	640	42,998	82,339	0	43,906
2000	640	41,292	70,362	0	30,033
2001	640	41,292	70,362		
2002	640	41,292	70,362		
2003	640	41,292	70,362		
2004	640	41,292	70,362		
2005	640	41,292	70,362		
2006	640	41,292	70,362		
2007	640	41,292	70,362		
2008	640	41,292	70,362		
2009	640	41,292	70,362		
2010	640	41,292	70,362		
2011	640	41,292	70,362		
2012	640	41,292	70,362		
2013	640	41,292	70,362		
2014	640	41,292	70,362		
2015	640	41,292	70,362		
2016	640	41,292	70,362		
2017	640	41,292	70,462		
2018	640	41,292	70,362		
2019	640	41,292	70,362		

TABLE 2

COMPARISON OF MODELED ANNUAL AIDS CASES

Year	SOA Committe on HIV Research			Cowell/Hoskins		CDC
	Low	Middle	High	Infection Declines	Infection Continues	
1975.....	0	0	0	0	0	
1976.....	2	1	0	0	0	
1977.....	11	4	2	3	3	
1978.....	36	18	11	12	12	
1979.....	95	61	42	44	44	
1980.....	232	185	139	140	140	
1981.....	545	503	415	389	389	348
1982.....	1,252	1,236	1,120	950	950	1,023
1983.....	2,820	2,788	2,712	2,069	2,069	2,856
1984.....	5,875	5,777	5,772	4,070	4,070	5,832
1985.....	10,924	10,740	10,761	7,343	7,343	10,957
1986.....	18,121	17,702	17,958	12,334	12,334	18,115
1987.....	26,989	26,219	27,438	19,510	19,510	27,976
1988.....	36,671	35,724	39,104	29,318	29,318	35,291
1989.....	46,111	45,644	52,704	42,073	42,172	45,137
1990.....	54,274	55,433	67,855	57,807	58,426	55,129
1991.....	60,415	64,644	84,052	76,204	78,312	64,737
1992.....	64,053	72,873	100,712	96,487	101,684	73,440
1993.....	65,012	79,765	117,222	117,307	127,765	
1994.....	63,409	85,105	132,974	136,681	155,081	
1995.....	59,618	88,815	147,399	152,324	181,451	
1996.....	54,176	90,905	159,995	162,613	204,326	
1997.....	47,679	91,470	170,362	166,872	221,372	
1998.....	40,711	90,670	178,215	165,155	231,003	
1999.....	33,776	88,710	183,399	158,143	232,722	
2000.....	27,267	85,833	185,884	146,971	227,144	
2001.....	21,453	82,282	185,758			
2002.....	16,481	78,294	183,217			
2003.....	12,391	74,095	178,572			
2004.....	9,144	69,878	172,199			
2005.....	6,649	65,799	164,506			
2006.....	4,790	61,974	155,905			
2007.....	3,443	58,482	146,789			
2008.....	2,492	55,370	137,518			
2009.....	1,839	52,656	128,400			
2010.....	1,400	50,335	119,693			
2011.....	1,112	48,389	111,592			
2012.....	927	46,785	104,236			
2013.....	811	45,485	97,712			
2014.....	740	44,450	92,053			
2015.....	697	43,637	87,252			
2016.....	672	43,010	83,267			
2017.....	657	42,534	80,034			
2018.....	649	42,177	77,467			
2019.....	645	41,914	75,475			

TABLE 3

COMPARISON OF MODELED ANNUAL AIDS DEATHS

Year	SOA Committe on HIV Research			Cowell/Hoskins	
	Low	Middle	High	Infection Declines	Infection Continues
1975.....	0	0	0	0	0
1976.....	1	0	0	0	0
1977.....	4	1	1	1	1
1978.....	13	6	4	7	7
1979.....	39	22	15	22	22
1980.....	99	71	52	76	76
1981.....	237	203	162	215	215
1982.....	553	523	454	541	541
1983.....	1,259	1,232	1,155	1,216	1,216
1984.....	2,719	2,673	2,618	2,470	2,470
1985.....	5,372	5,280	5,257	4,597	4,597
1986.....	8,980	8,801	8,850	7,950	7,950
1987.....	14,101	13,756	14,103	12,923	12,923
1988.....	20,979	20,432	21,610	19,924	19,924
1989.....	28,806	28,223	31,092	29,308	29,352
1990.....	36,767	36,620	42,313	41,279	41,583
1991.....	44,173	45,258	55,078	55,807	56,919
1992.....	50,385	53,750	69,047	72,532	75,463
1993.....	54,922	61,724	83,793	90,679	96,928
1994.....	57,499	68,858	98,834	108,957	120,505
1995.....	58,046	74,902	113,664	125,688	144,809
1996.....	56,693	79,697	127,780	139,284	167,991
1997.....	53,722	83,166	140,712	148,638	188,058
1998.....	49,511	85,305	152,051	153,204	203,289
1999.....	44,478	86,176	161,467	152,976	212,565
2000.....	39,025	85,895	168,726	148,417	215,575
2001.....	33,510	84,619	173,696		
2002.....	28,215	82,525	176,347		
2003.....	23,345	79,807	176,752		
2004.....	19,022	76,655	175,081		
2005.....	15,300	73,246	171,577		
2006.....	12,177	69,739	166,535		
2007.....	9,616	66,265	160,279		
2008.....	7,556	62,928	153,140		
2009.....	5,926	59,804	145,441		
2010.....	4,654	56,944	137,481		
2011.....	3,672	54,379	129,525		
2012.....	2,922	52,117	121,798		
2013.....	2,352	50,157	114,479		
2014.....	1,922	48,482	107,703		
2015.....	1,599	47,070	101,559		
2016.....	1,357	45,896	96,098		
2017.....	1,176	44,932	91,334		
2018.....	1,041	44,147	87,250		
2019.....	940	43,517	83,808		

TABLE 4

ANNUAL AIDS DEATHS PROJECTIONS FOR MIDDLE SCENARIO

Year	Infected in Year							Total
	Before 1986	1986	1987	1988	1989	1990	After 1990	
1975.....	0	0	0	0	0	0	0	0
1976.....	0	0	0	0	0	0	0	0
1977.....	1	0	0	0	0	0	0	1
1978.....	6	0	0	0	0	0	0	6
1979.....	22	0	0	0	0	0	0	22
1980.....	71	0	0	0	0	0	0	71
1981.....	203	0	0	0	0	0	0	203
1982.....	523	0	0	0	0	0	0	523
1983.....	1,232	0	0	0	0	0	0	1,232
1984.....	2,673	0	0	0	0	0	0	2,673
1985.....	5,280	0	0	0	0	0	0	5,280
1986.....	8,801	0	0	0	0	0	0	8,801
1987.....	13,583	173	0	0	0	0	0	13,756
1988.....	19,482	798	153	0	0	0	0	20,432
1989.....	25,526	1,862	705	129	0	0	0	28,223
1990.....	31,107	3,151	1,646	597	118	0	0	36,620
1991.....	35,926	4,499	2,786	1,394	545	108	0	45,258
1992.....	39,754	5,794	3,977	2,360	1,272	501	93	53,750
1993.....	42,445	6,959	5,122	3,368	2,153	1,168	510	61,724
1994.....	43,939	7,933	6,152	4,338	3,073	1,977	1,446	68,858
1995.....	44,254	8,672	7,012	5,210	3,957	2,822	2,974	74,902
1996.....	43,476	9,152	7,666	5,939	4,753	3,635	5,076	79,697
1997.....	41,745	9,369	8,090	6,493	5,418	4,366	7,685	83,166
1998.....	39,238	9,333	8,282	6,853	5,923	4,977	10,700	85,305
1999.....	36,151	9,070	8,250	7,015	6,251	5,440	13,999	86,176
2000.....	32,685	8,614	8,017	6,988	6,399	5,742	17,450	85,895
2001.....	29,026	8,010	7,615	6,791	6,375	5,878	20,925	84,619
2002.....	25,343	7,300	7,080	6,450	6,195	5,855	24,302	82,525
2003.....	21,772	6,529	6,453	5,997	5,884	5,690	27,482	79,807
2004.....	18,420	5,736	5,771	5,466	5,471	5,404	30,386	76,655
2005.....	15,360	4,954	5,070	4,888	4,986	5,025	32,963	73,246
2006.....	12,634	4,211	4,379	4,294	4,459	4,580	35,182	69,739
2007.....	10,258	3,525	3,722	3,709	3,918	4,096	37,036	66,265
2008.....	8,231	2,910	3,116	3,153	3,384	3,598	38,536	62,928
2009.....	6,531	2,369	2,572	2,640	2,876	3,108	39,707	59,804
2010.....	5,131	1,905	2,094	2,178	2,408	2,642	40,585	56,944
2011.....	3,994	1,515	1,684	1,774	1,987	2,212	41,213	54,379
2012.....	3,084	1,192	1,339	1,427	1,618	1,825	41,633	52,117
2013.....	2,364	929	1,053	1,134	1,301	1,486	41,888	50,157
2014.....	1,802	718	821	892	1,035	1,195	42,019	48,482
2015.....	1,366	550	634	695	814	950	42,060	47,070
2016.....	1,032	420	487	537	634	748	42,039	45,896
2017.....	777	318	371	412	490	583	41,981	44,932
2018.....	583	240	281	314	376	450	41,902	44,147
2019.....	437	181	212	238	287	345	41,816	43,517

Infection Spread: 4,000,000 at risk, middle scenario to match CDC.
Progression Rates: Weibull, median 10 years, alpha 2.1
Mortality after Diagnosis: 40%-40%-35%-25%; cases before 1986 higher.

2.3 Basis for Obtaining Insured Mortality Rates for 1983 and Prior Issues

As discussed earlier, insured lives have a different exposure to AIDS than the general population. The Task Force studied two approaches for translating mortality rates from the general population to insured lives covered by policies written in 1983 and prior years.

Approach 1

The Task Force compared actual AIDS death claim amounts and numbers of deaths for individually underwritten life insurance business from the ACLI/HIAA AIDS-Related Claims Survey to those expected based on an approximation of in-force amounts and numbers of policies by age group. The Task Force also compared individual life insurance AIDS claims from nine large insurance companies to expected AIDS claims using actual in-force amounts and number of policies by age group.

In each study the expected deaths were based on male life insurance in-force data for attained age groups multiplied by the middle scenario male general population AIDS mortality rate for the central age of each group. Details of these analyses are found in Appendixes 2 and 3.

The results of the two comparisons are shown below. Since the ACLI/HIAA Claims Survey covers a broader cross-section of the insurance industry, its higher ratios are not unreasonable.

	Ratio of Actual AIDS Claims to Expected AIDS Claims	
	By Number	By Amount
ACLI/HIAA Survey (1986–87)	46%	31%
Task Force Study (1986–88)	37	21

The data are not adjusted for the likely underreporting of actual AIDS insurance claims, nor are the data adjusted for AIDS-related deaths not meeting the CDC definition that have been reported as AIDS claims. The extent of underreporting of AIDS claims to and by insurance companies is unknown, but must be considered in determining actual/expected ratios. Although there is also underreporting of deaths to the CDC, this underreporting is likely to occur for both actual and expected claims (that is, AIDS deaths not reported to the CDC are not likely to be identified as AIDS

TABLE 5

MALE GENERAL POPULATION AIDS MORTALITY RATES PER THOUSAND LIVES FOR MIDDLE SCENARIO

Calendar Year	Attained Age in 1986																		
	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
1986...				0.000	0.000	0.003	0.007	0.012	0.016	0.021	0.026	0.037	0.052	0.069	0.086	0.102	0.119	0.137	0.154
1987...			0.000	0.000	0.004	0.011	0.019	0.026	0.034	0.041	0.060	0.083	0.109	0.136	0.161	0.186	0.212	0.238	0.261
1988...		0.000	0.000	0.006	0.017	0.029	0.040	0.051	0.062	0.090	0.125	0.164	0.204	0.240	0.276	0.314	0.350	0.381	0.404
	Attained Age in 1989																		
	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33
1989...	0.000	0.000	0.008	0.024	0.040	0.056	0.072	0.088	0.127	0.176	0.230	0.285	0.334	0.382	0.431	0.477	0.518	0.548	0.568
1990...	0.000	0.011	0.032	0.054	0.075	0.096	0.118	0.169	0.233	0.303	0.374	0.437	0.497	0.556	0.612	0.661	0.698	0.723	0.739
1991...	0.014	0.040	0.067	0.094	0.121	0.147	0.213	0.295	0.385	0.474	0.554	0.627	0.699	0.766	0.823	0.866	0.892	0.907	0.910
1992...	0.049	0.081	0.113	0.145	0.177	0.257	0.358	0.469	0.578	0.674	0.760	0.844	0.921	0.985	1.032	1.059	1.071	1.068	1.055
1993...	0.094	0.131	0.169	0.206	0.301	0.422	0.554	0.683	0.794	0.892	0.986	1.071	1.140	1.189	1.215	1.222	1.213	1.192	1.162
1994...	0.148	0.191	0.233	0.343	0.483	0.635	0.783	0.910	1.018	1.120	1.210	1.282	1.332	1.355	1.356	1.338	1.308	1.270	1.218
1995...	0.210	0.257	0.381	0.539	0.711	0.877	1.017	1.133	1.241	1.333	1.406	1.454	1.473	1.466	1.440	1.401	1.355	1.297	1.221
1996...	0.273	0.407	0.577	0.763	0.944	1.096	1.225	1.346	1.450	1.533	1.585	1.602	1.589	1.553	1.503	1.448	1.379	1.292	1.197
1997...	0.426	0.606	0.804	0.996	1.159	1.299	1.432	1.548	1.639	1.695	1.710	1.689	1.643	1.582	1.516	1.438	1.341	1.236	1.134
1998...	0.626	0.832	1.033	1.204	1.354	1.499	1.626	1.724	1.783	1.795	1.766	1.709	1.637	1.561	1.474	1.368	1.255	1.145	1.053
1999...	0.849	1.056	1.233	1.391	1.545	1.682	1.787	1.849	1.857	1.819	1.752	1.668	1.583	1.489	1.375	1.255	1.140	1.043	0.967
2000...	1.064	1.246	1.411	1.573	1.718	1.829	1.893	1.896	1.850	1.772	1.678	1.584	1.483	1.364	1.238	1.119	1.019	0.942	0.879
2001...	1.227	1.392	1.557	1.706	1.821	1.888	1.896	1.855	1.782	1.691	1.598	1.495	1.370	1.238	1.113	1.008	0.927	0.860	0.803
2002...	1.361	1.527	1.677	1.796	1.865	1.877	1.842	1.774	1.688	1.597	1.493	1.364	1.227	1.096	0.987	0.903	0.834	0.774	0.721
2003...	1.484	1.635	1.755	1.828	1.844	1.815	1.753	1.672	1.584	1.478	1.347	1.205	1.070	0.958	0.872	0.801	0.740	0.686	0.632
2004...	1.584	1.705	1.779	1.799	1.776	1.721	1.646	1.561	1.455	1.321	1.176	1.038	0.923	0.836	0.764	0.703	0.648	0.595	0.544
2005...	1.647	1.723	1.746	1.730	1.682	1.612	1.531	1.426	1.291	1.143	1.002	0.886	0.798	0.725	0.664	0.610	0.558	0.508	0.463
2006...	1.639	1.665	1.654	1.613	1.551	1.477	1.379	1.250	1.110	0.975	0.864	0.777	0.705	0.642	0.586	0.533	0.483	0.438	0.399
2007...	1.585	1.579	1.544	1.489	1.422	1.330	1.209	1.077	0.948	0.841	0.756	0.683	0.620	0.562	0.508	0.458	0.414	0.375	0.341
2008...	1.506	1.477	1.429	1.368	1.283	1.169	1.044	0.922	0.819	0.736	0.663	0.598	0.539	0.484	0.435	0.390	0.352	0.319	0.291
2009...	1.415	1.373	1.317	1.238	1.132	1.013	0.897	0.798	0.717	0.644	0.577	0.517	0.462	0.412	0.369	0.331	0.298	0.271	0.250
2010...	1.321	1.271	1.198	1.098	0.986	0.875	0.780	0.700	0.626	0.559	0.497	0.442	0.392	0.349	0.312	0.280	0.253	0.233	0.221
2011...	1.214	1.144	1.049	0.942	0.836	0.745	0.669	0.598	0.534	0.475	0.422	0.374	0.333	0.298	0.267	0.241	0.223	0.211	0.203
2012...	1.096	1.005	0.902	0.801	0.714	0.641	0.573	0.512	0.455	0.404	0.359	0.319	0.285	0.256	0.231	0.213	0.202	0.195	0.188
2013...	0.967	0.869	0.771	0.687	0.617	0.552	0.492	0.438	0.389	0.345	0.307	0.274	0.246	0.223	0.205	0.195	0.188	0.181	0.173
2014...	0.840	0.745	0.664	0.596	0.533	0.476	0.423	0.376	0.334	0.297	0.265	0.238	0.215	0.198	0.188	0.181	0.175	0.167	0.156
2015...	0.724	0.645	0.579	0.518	0.462	0.411	0.365	0.324	0.288	0.258	0.231	0.209	0.193	0.183	0.176	0.170	0.162	0.152	0.141
2016...	0.629	0.564	0.505	0.450	0.401	0.356	0.316	0.281	0.251	0.225	0.204	0.188	0.178	0.172	0.166	0.158	0.148	0.137	0.126
2017...	0.552	0.494	0.441	0.392	0.348	0.309	0.275	0.246	0.221	0.199	0.184	0.174	0.168	0.162	0.155	0.145	0.134	0.123	0.113
2018...	0.486	0.433	0.386	0.342	0.304	0.271	0.242	0.217	0.196	0.181	0.171	0.165	0.160	0.152	0.142	0.132	0.121	0.111	0.102
2019...	0.427	0.380	0.337	0.300	0.267	0.238	0.214	0.193	0.178	0.169	0.163	0.157	0.150	0.140	0.130	0.120	0.110	0.101	0.093

Infection Spread: 4,000,000 at risk, middle scenario to match CDC.
Progression Rates: Weibull, median 10 years, alpha 2.1.
Mortality after Diagnosis: 40%-40%-35%-25%; cases before 1986 higher.
Age/Sex Splits: 90% male, distribute all cases among ages 15–79.
Included Deaths: 100% of all years' infections.

TABLE 5—*Continued*

Calendar Year	Attained Age in 1989																		
	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49
1986...	0.170	0.181	0.188	0.192	0.193	0.192	0.191	0.188	0.183	0.177	0.170	0.163	0.157	0.149	0.142	0.134	0.125	0.116	0.107
1987...	0.277	0.288	0.294	0.296	0.295	0.292	0.286	0.277	0.265	0.253	0.241	0.231	0.221	0.210	0.199	0.188	0.175	0.161	0.147
1988...	0.419	0.428	0.431	0.430	0.425	0.415	0.398	0.378	0.357	0.339	0.324	0.310	0.297	0.283	0.268	0.251	0.232	0.213	0.195
	Attained Age in 1989																		
	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52
1989...	0.580	0.585	0.584	0.576	0.559	0.533	0.502	0.471	0.445	0.425	0.408	0.391	0.375	0.356	0.335	0.311	0.287	0.264	0.244
1990...	0.745	0.744	0.733	0.709	0.672	0.628	0.585	0.550	0.524	0.504	0.485	0.467	0.445	0.420	0.392	0.363	0.336	0.312	0.294
1991...	0.903	0.887	0.856	0.810	0.757	0.704	0.661	0.628	0.600	0.575	0.550	0.523	0.493	0.460	0.428	0.398	0.371	0.351	0.334
1992...	1.032	0.994	0.939	0.877	0.815	0.763	0.723	0.687	0.655	0.624	0.592	0.557	0.521	0.486	0.453	0.425	0.403	0.386	0.371
1993...	1.116	1.053	0.982	0.913	0.853	0.805	0.763	0.724	0.687	0.649	0.610	0.572	0.534	0.500	0.470	0.448	0.431	0.417	0.401
1994...	1.148	1.070	0.993	0.927	0.872	0.823	0.778	0.735	0.693	0.651	0.610	0.572	0.537	0.507	0.484	0.468	0.455	0.440	0.419
1995...	1.137	1.055	0.983	0.923	0.867	0.816	0.769	0.723	0.679	0.637	0.598	0.563	0.533	0.511	0.496	0.484	0.471	0.451	0.422
1996...	1.104	1.024	0.958	0.900	0.846	0.796	0.747	0.699	0.653	0.609	0.571	0.539	0.516	0.502	0.492	0.480	0.461	0.433	0.400
1997...	1.047	0.977	0.916	0.861	0.809	0.759	0.707	0.657	0.611	0.569	0.535	0.513	0.500	0.491	0.480	0.463	0.437	0.405	0.372
1998...	0.979	0.916	0.861	0.809	0.757	0.704	0.652	0.603	0.559	0.524	0.502	0.489	0.482	0.473	0.458	0.433	0.404	0.372	0.340
1999...	0.903	0.848	0.797	0.745	0.691	0.637	0.586	0.542	0.507	0.484	0.473	0.467	0.460	0.446	0.424	0.397	0.367	0.338	0.309
2000...	0.825	0.775	0.724	0.670	0.615	0.564	0.519	0.484	0.462	0.452	0.448	0.442	0.430	0.409	0.385	0.358	0.331	0.304	0.279
2001...	0.751	0.698	0.644	0.591	0.541	0.498	0.463	0.441	0.429	0.422	0.415	0.402	0.383	0.360	0.336	0.312	0.288	0.264	0.240
2002...	0.667	0.613	0.562	0.514	0.473	0.439	0.416	0.403	0.394	0.386	0.373	0.355	0.335	0.313	0.292	0.270	0.249	0.227	0.206
2003...	0.579	0.530	0.485	0.446	0.413	0.390	0.376	0.366	0.357	0.344	0.327	0.309	0.290	0.271	0.252	0.233	0.213	0.194	0.175
2004...	0.497	0.454	0.418	0.387	0.364	0.349	0.339	0.329	0.316	0.301	0.284	0.267	0.250	0.233	0.216	0.199	0.182	0.165	0.149
2005...	0.424	0.389	0.360	0.338	0.323	0.312	0.302	0.290	0.275	0.260	0.245	0.230	0.215	0.200	0.185	0.170	0.155	0.140	0.125
2006...	0.365	0.336	0.314	0.299	0.289	0.280	0.268	0.253	0.239	0.224	0.209	0.194	0.181	0.167	0.154	0.141	0.128	0.115	0.101
2007...	0.312	0.291	0.277	0.268	0.259	0.247	0.233	0.219	0.204	0.189	0.176	0.163	0.151	0.140	0.128	0.117	0.105	0.093	0.082
2008...	0.270	0.257	0.248	0.239	0.229	0.215	0.201	0.186	0.172	0.159	0.148	0.137	0.127	0.116	0.107	0.096	0.086	0.076	0.066
2009...	0.238	0.229	0.222	0.211	0.198	0.184	0.170	0.157	0.145	0.134	0.124	0.115	0.106	0.098	0.089	0.079	0.070	0.062	0.055
2010...	0.213	0.206	0.196	0.183	0.170	0.156	0.143	0.132	0.122	0.113	0.105	0.097	0.090	0.082	0.073	0.065	0.058	0.051	0.048
2011...	0.197	0.187	0.175	0.162	0.149	0.137	0.126	0.117	0.108	0.101	0.093	0.086	0.078	0.070	0.062	0.055	0.049	0.046	0.043
2012...	0.180	0.168	0.156	0.143	0.131	0.121	0.112	0.104	0.097	0.089	0.082	0.075	0.067	0.059	0.053	0.047	0.044	0.041	0.038
2013...	0.162	0.150	0.138	0.126	0.116	0.108	0.100	0.093	0.086	0.079	0.072	0.064	0.057	0.051	0.045	0.042	0.040	0.037	0.034
2014...	0.145	0.133	0.122	0.112	0.104	0.097	0.090	0.083	0.077	0.070	0.062	0.055	0.049	0.044	0.041	0.038	0.036	0.033	0.030
2015...	0.129	0.119	0.109	0.101	0.094	0.087	0.080	0.074	0.068	0.060	0.054	0.048	0.042	0.040	0.037	0.035	0.032	0.029	0.027
2016...	0.116	0.106	0.098	0.091	0.085	0.078	0.073	0.066	0.059	0.052	0.046	0.041	0.039	0.036	0.034	0.031	0.029	0.026	0.023
2017...	0.104	0.096	0.089	0.083	0.077	0.071	0.064	0.058	0.051	0.045	0.040	0.038	0.035	0.033	0.030	0.028	0.025	0.023	
2018...	0.095	0.088	0.082	0.075	0.070	0.063	0.057	0.050	0.045	0.040	0.037	0.035	0.032	0.030	0.027	0.025	0.023		
2019...	0.087	0.081	0.074	0.069	0.062	0.056	0.050	0.044	0.039	0.037	0.034	0.032	0.029	0.027	0.025	0.022			

TABLE 5—*Continued*

Calendar Year	Attained Age in 1986																	
	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67
1986...	0.097	0.088	0.080	0.073	0.068	0.063	0.058	0.053	0.048	0.044	0.039	0.035	0.031	0.028	0.025	0.023	0.020	0.018
1987...	0.134	0.123	0.113	0.105	0.098	0.091	0.084	0.077	0.069	0.062	0.055	0.049	0.043	0.039	0.035	0.031	0.028	0.025
1988...	0.180	0.167	0.156	0.146	0.137	0.127	0.116	0.104	0.093	0.082	0.073	0.065	0.058	0.051	0.045	0.041	0.036	0.032
	Attained Age in 1989																	
	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70
1989...	0.228	0.215	0.203	0.191	0.178	0.163	0.146	0.130	0.114	0.101	0.089	0.079	0.071	0.062	0.055	0.049	0.043	0.038
1990...	0.278	0.265	0.250	0.234	0.214	0.193	0.170	0.149	0.131	0.116	0.103	0.091	0.079	0.071	0.062	0.054	0.048	0.042
1991...	0.319	0.304	0.286	0.263	0.237	0.211	0.186	0.164	0.145	0.128	0.113	0.099	0.088	0.077	0.067	0.059	0.051	0.045
1992...	0.355	0.335	0.310	0.281	0.251	0.222	0.196	0.174	0.154	0.136	0.118	0.104	0.091	0.079	0.069	0.060	0.053	0.050
1993...	0.380	0.353	0.322	0.289	0.257	0.228	0.203	0.179	0.158	0.137	0.120	0.104	0.090	0.078	0.068	0.060	0.056	0.053
1994...	0.391	0.358	0.323	0.288	0.257	0.229	0.203	0.178	0.154	0.134	0.116	0.100	0.087	0.075	0.065	0.062	0.058	0.054
1995...	0.388	0.352	0.316	0.283	0.253	0.223	0.195	0.168	0.146	0.126	0.109	0.093	0.080	0.070	0.066	0.062	0.058	0.054
1996...	0.365	0.330	0.297	0.267	0.237	0.208	0.181	0.157	0.136	0.117	0.100	0.086	0.074	0.070	0.066	0.061	0.057	0.053
1997...	0.338	0.306	0.276	0.246	0.217	0.190	0.166	0.144	0.124	0.106	0.090	0.077	0.073	0.068	0.063	0.058	0.054	0.049
1998...	0.310	0.281	0.252	0.223	0.196	0.172	0.149	0.128	0.109	0.093	0.079	0.074	0.069	0.064	0.059	0.054	0.049	0.044
1999...	0.282	0.254	0.226	0.199	0.175	0.153	0.131	0.112	0.094	0.080	0.075	0.070	0.064	0.059	0.053	0.048	0.042	
2000...	0.252	0.225	0.200	0.176	0.154	0.132	0.112	0.094	0.080	0.074	0.069	0.063	0.058	0.052	0.046	0.041		
2001...	0.216	0.193	0.171	0.150	0.130	0.110	0.093	0.080	0.074	0.068	0.063	0.057	0.051	0.046	0.040			
2002...	0.185	0.165	0.145	0.126	0.108	0.092	0.078	0.073	0.067	0.061	0.056	0.050	0.044	0.038				
2003...	0.157	0.139	0.121	0.104	0.089	0.076	0.071	0.065	0.059	0.054	0.048	0.042	0.037					
2004...	0.132	0.116	0.100	0.086	0.074	0.068	0.063	0.057	0.052	0.046	0.041	0.035						
2005...	0.110	0.095	0.082	0.071	0.066	0.060	0.055	0.049	0.044	0.039	0.033							
2006...	0.088	0.077	0.067	0.062	0.057	0.052	0.047	0.042	0.037	0.032								
2007...	0.071	0.062	0.058	0.054	0.049	0.045	0.040	0.036	0.032									
2008...	0.058	0.054	0.050	0.047	0.043	0.039	0.035	0.031										
2009...	0.051	0.048	0.044	0.040	0.037	0.033	0.030											
2010...	0.045	0.042	0.039	0.035	0.032	0.029												
2011...	0.040	0.037	0.034	0.031	0.028													
2012...	0.035	0.032	0.030	0.027														
2013...	0.031	0.028	0.026															
2014...	0.027	0.025																
2015...	0.024																	
2016...																		
2017...																		
2018...																		
2019...																		

claims by individual companies) and should have only a slight effect on the actual actual/expected ratios.

The Task Force Study showed slightly declining ratios by number for the individual years 1986–88, but more rapidly decreasing ratios by amount (see Appendix 3). This may indicate that over that period companies were giving more attention to AIDS claims and possibly identifying smaller size claims that may not have previously been identified as being caused by AIDS. Further study may be needed in this area.

The higher actual/expected ratios by number are surprising. However, the expected claims are based on in-force amounts without regard to duration. These in-force amounts are more heavily weighted with recent issues with a larger average size than actual claims. The use of aggregate AIDS mortality rates does not recognize the effect of selection in identifying AIDS-related infections and symptoms, which minimizes AIDS claims in early policy years. Thus, number of policies should be taken into account in this approximation to avoid the average size distortion caused by recent issues and selection.

Another explanation may be that homosexual/bisexual males and IV drug users may have fewer family responsibilities than other insureds at the same ages, hence lower size policies. The relationship between number and amount of AIDS claims should be studied for future changes.

Because the actual/expected ratios vary widely among individual companies, the factors used to adjust general population AIDS mortality rates to insured life AIDS mortality rates should be tailored to reflect individual company differences in experience if available. If possible, companies should relate their AIDS claims to exposures by policy duration as well as age.

Approach 2

A more subjective approach also was used to estimate the underrepresentation of AIDS deaths (by number). The Task Force assumed that, relative to the general population, the major categories of persons dying from AIDS are underrepresented among insured lives for individual life insurance. The Task Force assumed 5 percent representation for the IV drug users and 50 percent for homosexuals/bisexuals and others, with respect to expected levels of representation of the general population.

These factors were applied to AIDS deaths reported to the CDC from June 1981 through February 20, 1989, with the following results:

Category	Reported	Adjusted	Ratio
Homosexual/Bisexual	30,165	15,082	50.0%
IV Drug Users	9,689	485	5.0
IV and Homosexual/ Bisexual	3,731	187	5.0
Others	6,391	3,196	50.0
Total	49,976	18,950	37.9

The factors of 5 percent and 50 percent in the above illustration are not unreasonable and produce a result within the range obtained from Approach 1. Companies that, because of the nature of the business written, may have greater exposure to high-risk groups than assumed above would be expected to have higher factors.

2.4 Basis for Obtaining Insured Mortality Rates for 1984 and Later Issues

Prior to 1984, there was little knowledge of AIDS; hence little antiselection against life insurance companies occurred. When AIDS became generally recognized, issues of 1984 and later were likely to have been for larger amounts than previously, with a concentration of amounts just below the minimum amount of insurance for which testing was required. This antiselection by number and amount of insurance also will produce higher actual/expected ratios for 1984 and later untested issues.

For tested business, it can be assumed that an HIV-infected applicant would not qualify for insurance, except in those cases where the test did not detect infection because the person had just become infected. However, the test gives no assurance that the applicant will not become infected later, so mortality rates associated with deaths from infections on or after the date of testing should be used. Some antiselection in this group should be assumed because some buyers who know they are at risk would now buy insurance or may have bought more insurance than they otherwise would have purchased.

The high incidence of sexually transmitted disease among young persons suggests that a significant increase in HIV infections among heterosexuals may occur. To the extent this occurs, the factors previously discussed may need to be increased to recognize the impact of this increase among buyers of individual life insurance policies.

2.5 Adjustment Factors for Translating Mortality Rates

Based on the prior sections of this report, the Task Force concluded that it is reasonable to adjust the general population AIDS mortality rates to an

insured lives basis by multiplying population mortality rates by the following factors:

- 40 percent for business (all untested) issued in 1983 and prior years
- 80 percent for untested business issued in 1984 and later years
- 60 percent for tested business (apply this factor after adjustment for tested business; see below).

For untested business, the factors should be applied directly to the AIDS mortality rates in Table 5.

For tested business, the AIDS mortality rates in Table 5 should be adjusted before applying the above factor. This adjustment excludes deaths resulting from infections prior to the year the business was tested for HIV infection. To make this adjustment, multiply the AIDS mortality rates in Table 5 by the ratio obtained from Table 4 of the deaths resulting from infections in or after year X to all deaths in the appropriate calendar year, where year X is the year in which the business was HIV-tested. For example, for applicants tested in 1989, the adjustment to determine the AIDS mortality rate for calendar year 2000 is based on the following. First, compute the ratio of the sum of the deaths from HIV infections in 1989 and later (6,399 + 5,742 + 17,450) to total AIDS deaths from all HIV infections prior to the year 2000 (85,895); the result is 0.345. This ratio is then multiplied by the 60 percent factor for tested business and the result (20.7 percent) is applied to the mortality rates in Table 5.

Rationale for Adjustment Factors

The 40 percent factor for 1983 and prior issues is based on the actual/expected ratio from the two studies reported in Section 2.3. This factor gives weight to the results by number in order to correct for the likely overstatement of expected deaths by amount discussed in Section 2.3 (Approach 1). A more conservative approach would be to use a factor higher than 40 percent to give greater weight to the likely overstatement of expected deaths and underreporting of actual AIDS deaths. The characteristics and trends in each company's business should be considered in order to determine whether a factor other than 40 percent should be selected.

The 80 percent factor for untested 1984 and later issues is double the 40 percent factor for earlier issues to account for the antiselection by both number of policies and amount of insurance that likely occurred after AIDS became generally recognized.

The 60 percent factor for tested business is applied after first adjusting the AIDS mortality rates to recognize the effect of testing, as previously described. This factor, for those becoming infected after testing negative, assumes a higher proportion of high-risk individuals in the tested group than in the untested group of 1983 and prior issues, because of antiselection among high-risk individuals who are motivated to purchase insurance in case they become infected later. However, this could be partially offset by the "sentinel effect" of testing, that is, the deterrence of high-risk individuals from being tested. In the absence of specific information, the Task Force has assumed a factor of 60 percent.

As mentioned in Section 1.3, lower rates of lapsation among high-risk and HIV-infected persons are likely to effectively increase AIDS mortality rates among in-force blocks. Thus, it may be necessary to increase these factors by policy durations. The extent of the increase will depend on the persistency of the non-AIDS business in each individual company versus the assumed persistency of the high-risk and HIV-infected business.

Although these factors seem reasonable, they should be applied with great discretion. Durational studies, as well as studies of issues of 1984 and later, divided into "tested" and "untested" business, are needed to monitor the validity of these factors. Tested business, which excludes nearly all of those who are HIV-infected at issue, will not have much effect on any company's AIDS claim experience for several years, because of the relatively long progression period from HIV infection to death from AIDS.

The adjustment factors provided in this section can be used as a starting point for the valuation actuary. Actual experience, if deemed sufficient, and the valuation actuary's judgment regarding his/her own company should take primacy.

2.6. Evaluation of Geographical Differences

Data from the CDC indicate a very uneven geographical distribution of AIDS cases and deaths. Table 6 shows AIDS cases reported to the CDC from February 1987 through January 1989, by state of residence. The table also contains the ratio of total AIDS cases to the total population ages 18–54 in each state. Total AIDS cases were used because subdivisions of AIDS cases by age were not readily available by state. Even though the majority of AIDS cases occur among males aged 18–54, the ratios do not represent a good proxy for AIDS mortality rates since total, not male, population formed the base. However, comparative state levels of the ratios are indicative of geographical influences.

TABLE 6

U.S. POPULATION
AIDS CASES AND INCIDENCE RATES
REPORTED FROM 2/87 THROUGH 1/89
BASED ON FEBRUARY 1989 CDC REPORTS

State	Rank by Number of Cases	1986 Population Ages 18–54 (000)	AIDS Cases 2/27-1/89	Ratio per 1,000	State to Average
DC	11	352	1,001	2.844	6.77
NY	1	9,281	10,936	1.178	2.80
NJ	5	3,990	4,047	1.014	2.41
FL	3	5,644	4,465	0.791	1.88
CA	2	14,673	10,664	0.727	1.73
TX	4	8,852	4,079	0.461	1.10
NV	29	539	234	0.434	1.03
MD	10	2,460	1,057	0.430	1.02
GA	8	3,282	1,408	0.429	1.02
CT	16	1,677	702	0.419	1.00
MA	9	3,124	1,206	0.386	0.92
DE	38	338	112	0.331	0.79
LA	14	2,341	734	0.314	0.75
RI	33	504	156	0.310	0.74
CO	19	1,859	575	0.309	0.74
WA	13	2,431	745	0.306	0.73
HI	32	574	174	0.303	0.72
AZ	20	1,699	501	0.295	0.70
IL	6	6,026	1,713	0.284	0.68
MO	17	2,582	684	0.265	0.63
PA	7	6,011	1,571	0.261	0.62
OR	24	1,433	359	0.251	0.60
VA	18	3,227	598	0.185	0.44
AL	23	2,080	383	0.184	0.44
TN	22	2,527	415	0.164	0.39
UT	37	813	125	0.154	0.37
SC	26	1,798	270	0.150	0.36
OH	12	5,529	825	0.149	0.36
OK	28	1,709	254	0.149	0.35
MI	15	4,794	703	0.147	0.35
MS	31	1,294	185	0.143	0.34
NC	21	3,391	481	0.142	0.34
MN	25	2,220	292	0.132	0.31
NM	39	770	98	0.127	0.30
NH	42	558	70	0.125	0.30
KS	35	1,259	148	0.118	0.28
AR	36	1,168	134	0.115	0.27
AK	45	313	33	0.105	0.25
VT	46	293	28	0.096	0.23
ME	43	605	56	0.093	0.22
IN	27	2,866	262	0.091	0.22
NE	41	810	71	0.088	0.21
WI	30	2,464	207	0.084	0.20
KY	34	1,943	150	0.077	0.18
IA	40	1,431	82	0.057	0.14
MT	47	421	22	0.052	0.12
ID	48	507	21	0.041	0.10
WV	44	969	40	0.041	0.10
WY	50	280	10	0.036	0.09
SD	49	347	11	0.032	0.08
MD	51	346	6	0.017	0.04
Total		126,404	53,103	0.420	

Ratios of AIDS cases to the total age 18–54 population are higher than the nationwide average in only eight states and the District of Columbia. Although this could be due to a greater degree of underreporting in the "low-risk" states, the lower ratios likely represent real differences in the AIDS mortality risk among states. Differences may be even greater if the data for large urban areas were compared to rural areas.

The Task Force examined whether comparable geographical differences exist in insurance industry claims data by comparing actual and expected 1986, 1987 and 1988 AIDS claims from nine large companies. Data were reported separately for each of the nine states with the highest number of AIDS cases (see Appendix 3) and on a combined basis for all other states. The expected claims were obtained by applying male population AIDS mortality rates (Table 5) to actual individual life insurance in force for males, ages 20–54, by five-year attained age groups, using the AIDS mortality rate for the central age in each group. The expected AIDS mortality rates vary by calender year as well as attained age, so they were applied to the life insurance exposures for each calendar year. The results from Appendix 3 (by number) are shown below, compared to population data from Table 6.

AIDS DEATHS STATE-TO-AVERAGE RATIOS

	U.S. Population*	Insured Lives†
Nine states studied	1.57	1.43
Other states	0.48	0.63
Total	1.00	1.00

*AIDS cases reported the CDC February 1987 through January 1989.
†Insured AIDS deaths from a company study 1986–1988.

It is likely that the smaller difference in ratios between the nine states and all other states for insured lives as compared to the general population is due to the small exposure in the insurance experience of IV drug users who are concentrated in the urban centers of the larger states. It should be noted, in particular, that the insured life, state-to-average ratios of Appendix 3 for New York and New Jersey are much lower than for CDC data. IV drug users account for much of the difference. However, cause of death reporting in New York City, where the death certificate shows only whether the death is due to natural or violent causes, is also a factor. Although state differences in ratios for insured lives are smaller than in the general population, they are still substantial. It is projected that these differences will decrease due

to the spread of the AIDS epidemic away from urban centers; however, it is likely that they will remain substantial.

2.7 Application of Geographical Factors

If a company has a distribution of business that is similar to the national population pattern, no geographical adjustment may be needed. If an adjustment is needed, however, various approaches can be taken to make adjustments for a company's own distribution.

As stated in Section 2.6, the Task Force intercompany study confirms the appropriateness of using geographical adjustments. However, the study by itself is not complete enough to determine factors for each state. Instead, the study was used to determine the reasonableness of the factors shown in Appendix 4.

Appendix 4 provides "state incidence multipliers" based on AIDS cases diagnosed in years 1986–1988 and reported to the CDC. Adjustments based on CDC data were made to exclude cases not likely to be found in the insured population. State trends were also recognized. For these reasons, the factors derived in Appendix 4 should be more applicable than those obtained directly from Table 6 of this report.

It should be noted that examining AIDS cases diagnosed rather than AIDS deaths gives the most current trends by state. The study in Appendix 3, covering the same years (1986–1988), was based on deaths. To judge the correlation between the results of Appendixes 3 and 4, we compared 1988 deaths from our study to 1986 diagnosed cases and found a reasonable correlation, where data were credible, except for New York. As noted earlier, problems with death certificate reporting in New York understate AIDS reporting to insurance companies.

Another geographical adjustment approach is shown in Appendix 5. If individual state factors are not desired, a simplified approach is to group data by states and use one factor to multiply against the general population mortality rates for the higher experience states and another for the lower experience states.

The Canadian Institute of Actuaries provided guidelines for use by Canadian companies with U.S. business. The CIA guidelines set forth geographical adjustments based on CDC state data with adjustments for IV drug users. The Task Force used a similar approach, but has included more current information upon which to base adjustments for the individual companies.

Some companies may have large regional concentrations of business. It is important to understand that the high ratios in certain states are largely due to the effects of AIDS in large urban centers. The Task Force recommends that companies that have business concentrated in large urban centers consider use of a higher adjustment factor. If business is mainly in rural areas, a smaller adjustment factor may be appropriate.

Finally, the actuary must be aware that the geographical distribution of AIDS-related deaths may shift over time. Thus, geographical adjustments used today may be inappropriate in the future.

2.8 Product and Underwriting Adjustments

Product and underwriting are other factors to be considered when adjusting AIDS mortality rates. Low-premium products (for example, term, universal life) present greater opportunities for antiselection. Companies that issue a high proportion of business on these plans should consider whether additional adjustments to the AIDS mortality rates to account for antiselection are needed. We have no information on which to base suggested factors. Each company should make its own determination about the adjustments needed.

Of primary importance are a company's underwriting procedures, in particular, HIV-antibody blood-testing limits. Changes in underwriting during the HIV/AIDS epidemic need to be analyzed, both in absolute terms and in comparison to other insurers. Insurers with the most liberal underwriting are most at risk of antiselection. Other underwriting factors, including the date on which a company started age and amount testing, the initial limits used, the dates on which testing limits changed, and the level of these changes may all affect the level of HIV infection in the insured population of a company. Hence, adjustments may be necessary to determine a specific company's level of expected AIDS mortality.

Persons already infected with the HIV virus can sometimes be identified through medical histories. If medical history questions are not asked (for example, guaranteed issue) or are not thorough (for example, simplified underwriting), HIV-infected individuals could be missed.

2.9 Calculation of AIDS Costs

A starting point for the valuation actuary's review of the financial implications of AIDS on a company is the calculation of the projected future cost of AIDS by calendar year. Some methods of converting this cost into reserves, earmarked surplus or adjustments in dividends, mortality charges,

and so on are discussed in Section 3. That section also describes some methods of establishing reserves, with examples in Appendix 7.

Stated simply, the process of determining the cost by year involves producing appropriate exposures and applying appropriate mortality rates. This process is described below. The method described assumes that the mortality rates have been geographically adjusted by the company as appropriate to its situation. (The alternative of applying separate mortality rates to geographically divided exposures could use a similar methodology.)

The following text describes an approximate, aggregate method, which is sufficiently accurate in view of the other, broader approximations involved. Actuaries who wish to use more refined methodology may use multiple decrement mathematics similar to that for disability insurance. In this case, the two groups are HIV-infected and non-HIV-infected with movement possible from the latter to the HIV-infected group. The rates of death and the rates of lapse are different in each group. In the following we assume a zero lapse rate in the infected group.

Calculating Exposures

In order to calculate exposures, the valuation actuary must produce year-end (or other valuation date) in-force amounts and reserves from the valuation files by sex, attained-age and year-of-issue groups. (The refinement of reflecting plan distribution is ignored in this example, but can be effected by plan-weighting the mortality rates or separating exposures by plan.) These are called basic valuation cells.

The valuation actuary then must project the in-force and reserves in these basic valuation cells through the use of *survivorship only* (that is, ignore lapsation) based on company experience and ignoring AIDS extra mortality for the next 20 years or more. The reason for ignoring lapse is to reflect the likelihood that the high-risk group has close to 100 percent persistency. The AIDS mortality rates will be applied to these exposures to produce AIDS claim costs.

Calculating Mortality Rates

Using the appropriate rates in Table 3, the actuary next should apply factors for the individual company comparable to the 40 percent/80 percent/60 percent and testing adjustments in Sections 2.5, plus geographical, product, underwriting, or other factors deemed appropriate to the company's distribution of business in force. He or she should produce AIDS mortality

rates by age, sex and calendar year for the company. (Alternatively, the percentage factors may be applied as appropriate to the basic valuation cells after projected claims, without adjustment, are calculated for those cells.)

Applying the Rates

Mortality rates, calculated as above, are now applied to the amount at risk exposed, calculated as above, in each valuation cell/calendar year combination. This produces AIDS claim costs by calendar year. This is the outward cash flow which may be offset by some inward cash flow, for example, allocated dividend adjustments, surplus allocation, price changes, or reduced profit margins. These are all discussed in Section 3.

If desired, these claim costs may be converted into mortality rates by dividing them by the corresponding exposures recalculated with persistency factors. These lapse-adjusted mortality rates can then be used in a traditional reserve calculation similar to that in Appendix 7. However, this produces another level of assumptions (persistency) that will need periodic review.

If present values of claims cost are to be obtained, the appropriate discount factors are those without a decrement for lapse, that is, interest only. If these present values are to be amortized or offset by a future inward cash flow from in-force policies, the appropriate annuity is one with a decrement for lapse.

While this is contrary to the statutory approach of ignoring lapse, we are dealing with two distinct subgroups, one of which produces most of the extra cost (and has low expected lapse rates) and one that produces most of the future income and has "normal" expected lapse rates. Statutory methodology may need to be modified to take this into account.

Qualifications

There are some discrepancies in the above methodology, the most important of which are:

1. There will be some lapses among the high-risk group, particularly among individuals who are not yet infected. The application of AIDS mortality rates to projected amounts at risk that were developed without lapse rates therefore overstates the AIDS deaths. Actuaries may therefore wish to use a lapse rate greater than zero in projecting exposures.
2. The use of annuity factors on the income side that take account of normal expected lapse will understate the positive cash flow, since the high-risk group, with low expected lapse rates, also contributes to income.

3. The factors suggested in Section 2.5, for example, 40 percent, are based on experience and therefore already adjust for lapse differentials so far experienced.

3. FINANCIAL ANALYSIS AND RESERVE CONSIDERATIONS

This section addresses financial analyses designed to assess the implications of AIDS for life insurance companies. We first define the Task Force's conclusions with respect to the role of the valuation actuary in this regard. Then we review certain issues to be considered in performing the calculations, discuss the importance of developing a company plan to deal with the cost of AIDS, and conclude with observations concerning statutory and GAAP reserves.

3.1 Role of the Valuation Actuary

The Task Force believes that the role of the valuation actuary with respect to the financial implications of AIDS is clear. In this context, the "valuation actuary" can be considered as either the Valuation Actuary or simply as the actuary responsible for performing the reserve valuation of the company. In either event, the Task Force believes that it is incumbent upon the actuary, in the exercise of his or her professional responsibility and to fulfill his or her responsibilities to management, to use the information now available concerning the effect of AIDS on mortality and morbidity experience to:

- Evaluate the potential financial impact of AIDS on the organization
- Identify and analyze alternative means of funding the expected costs of AIDS
- Evaluate the adequacy of existing reserves in the face of the AIDS epidemic.

That these are the responsibilities of the valuation actuary can be supported by actuarial responses to similar prior experience, the actuary's present responsibility to opine on the adequacy of reserves for statutory reporting purposes, and the emerging requirements of the Valuation Actuary concept.

Actuaries were faced with similar challenges in the 1930s with respect to the adequacy of disability income reserves and in the 1940s with respect to the adequacy of reserves in an environment of severely depressed interest rates. In both instances, actuaries responsible for reserve adequacy met their responsibility and evaluated the impact of severely unfavorable experience. These analyses led to the establishment of additional reserves in those instances in which valuation actuaries deemed it appropriate. In fact, the manner in which these reserves were strengthened may be useful when considering the sufficiency of current reserves for AIDS. These are clear historical precedents for actuaries responsible for the adequacy of reserves addressing the AIDS issue at this time.

Many believe that the present responsibility to opine on the "good and sufficient" level of reserves requires that actuaries analyze the present AIDS situation. The Task Force believes that, in order to support statements concerning the sufficiency of reserves, it is appropriate to perform cash-flow testing or gross premium valuations to consider the expected financial effect of AIDS on the adequacy of reserves.

3.2 Planning the Funding of AIDS Claims

The valuation actuary should assist the organization in identifying and evaluating alternative means of funding the expected costs of AIDS. The Task Force believes that the knowledge and technical skills needed to examine the possible impact of AIDS are now available, but there are broader questions, beyond data requirements and epidemiological models. Perhaps the most fundamental question to be answered is the manner in which alternative sources of funding AIDS claims are recognized, if at all, in the analyses of the costs associated with AIDS and the need for additional reserves. One aspect of this question is whether it is appropriate to use other margins for this purpose and, if so, to what extent.

The cost of AIDS can be computed as described in Section 2.9. However, from an individual company's perspective, there may be financial resources available to fund a portion of this cost. Generally, such resources would come from adjusting the nonguaranteed elements, if any, of the individual life business in force. Financial resources contained in the products of other lines of business might be considered as a secondary source of funds. In any event, a decision must be made by each company as to the treatment of potentially available resources in funding the AIDS cost.

Once the actuary has developed an understanding of the company's existing exposure derived from the in-force business written before or after specific underwriting for AIDS began, split by HIV-tested and untested business, and the potential exposure to AIDS from the sale of new business, he or she must determine whether additional funding is necessary and, if so, address the difficult challenge associated with selection of the most appropriate means of funding AIDS claims. Timely analysis of the potential for AIDS claims, early identification of alternative funding sources, and careful planning for the use of these sources should provide greater flexibility during the course of the epidemic. Failure to adequately examine the problem and alternative solutions may severely limit access to alternative funding sources in the intermediate and long-term horizon.

A significant issue to address is the extent to which existing and new policyholders will bear any costs of AIDS and the extent to which any costs will be borne by stockholders. Any assumption of this responsibility by owners or by the organization in general may have an impact on the viability of the organization. It is the actuary's responsibility to provide management with an evaluation of the potential impact of alternative approaches of absorbing the cost of AIDS.

Certain classes of policyholders may bear a part or all of the costs of the epidemic, through reduced policyholder dividends, increased adjustable premiums, or increased charges of nonguaranteed cost products. An important consideration for the valuation actuary is to determine from which groups of policyholders additional funding is to be obtained and to what extent. The current and anticipated AIDS claims for each of the groups may be an important factor in the decision, but other factors, such as practicality, may be important as well.

3.3 Alternative Funding Approaches

Another consideration is whether AIDS claims will be funded as incurred or whether advance funding of anticipated claims will be recommended.

It is assumed that companies seek to provide an adequate return on their equity, while maintaining surplus positions within a range that is acceptable to owners, management, rating agencies, and policyholders alike. The Task Force sees as its major concern the possible disruption in company cash flows as AIDS claims reach their anticipated peak, late in the 1990s. As companies seek to deal with the possible disruption, the question becomes one of the timing of additional charges on participating and other nonguaranteed cost business. For guaranteed cost business other funding sources must be identified and used.

The Task Force has concluded that it is preferable to fund AIDS claims in advance, to the extent it is practical. By this we mean that additional charges may be justified now, either to fund reserves or increase surplus, in order that the charges necessary to pay AIDS claims late in the 1990s can be muted as the accumulated charges from earlier years are released. An exception to this exists when anticipated AIDS claims are at such a low level that they pose no threat to normal company operations.

Pay As You Go

If there is no prefunding, annual AIDS claims will be paid from the aggregate cash flow of the organization. Unless surplus is permitted to drop

or grows at a slower rate than previously planned, all other things being equal, nonguaranteed cost and participating business will experience cost adjustments as AIDS claims emerge, through reduced dividends and increased policyholder charges. (The steep slope anticipated in these claims suggests consideration of projection techniques to avoid the lag that would otherwise occur as part of the normal mortality study process.) The major disadvantage of this approach is that without the security of additional funding set aside *before* AIDS claims reach their peak, a company reduces its flexibility to respond should AIDS claims reach unacceptably high levels in the future. In addition, the company may be *less* able to respond to deteriorations in other areas of experience.

If pay as you go becomes the funding plan by default, or if an appropriate plan is not properly communicated, the future financial impact may not be apparent to new and existing policyholders and shareholders. In these instances management may be viewed as having not met its responsibility to evaluate future risks, act accordingly and communicate properly.

Advance Funding

Through advance funding, the actuary can develop a plan to fund the costs of AIDS in advance over a reasonable period of time. Alternative methods of advance funding of AIDS claims are available, all of which would fund the aggregate expected level of AIDS claims over an appropriate period.

Advance funding may increase the company's operating flexibility and allow it to meet its responsibility to recognize the problem and act to prevent financial disaster. Funds set aside now will be available to pay additional AIDS claims later, when AIDS claims levels may be considerably higher. This will enable the company to scale back increases in future charges, thus providing options to the company in the event that future AIDS claims are greater than expected at the present time. Although higher lapses may initially occur, this more moderate near-term increase in policyholder costs may prevent future policyholder lapses from increasing, thus enhancing the ability of the organization to obtain the necessary funding.

If charges prove to be too great, adjustments can and should be made. The methods suggested herein are flexible enough to allow such adjustments.

3.4 Reserves/Surplus Allocation

The Task Force believes that if the valuation actuary's analysis indicates that additional provision for AIDS is needed, the preferred method of providing for the future cost of AIDS in financial statements is in reserves, but

if additional AIDS reserves are not maintained, the reasons for not so doing should be fully documented. Documentation could identify any allocation of surplus and plan of action for funding AIDS claims. Such plan of action might include changes to premiums, dividends or adjustable charges.

3.5 Financial Statement Considerations—Statutory

The primary objective of the valuation actuary's analysis of the need to provide additional reserves for the expected cost of AIDS is the determination of the adequacy of present statutory reserves. For the purposes of this report, the concept of reserve adequacy refers to the degree to which the cumulative insurance and related invested asset cash inflows exceed the corresponding cumulative insurance cash outflow at the end of the projected life of the business. These tests are most commonly performed using cash-flow-testing procedures.

A gross premium valuation can be a starting point, but it is recommended that the valuation actuary go beyond simple present values of future cash flows and analyze the year-by-year cash flows associated with alternative scenarios. Present values that appear manageable now may become difficult to manage because of the anticipated steep increase in AIDS mortality levels in later years. Margins available in earlier years, if not set aside, will not be available to fund costs occurring in later years. Also, it may not be appropriate to use margins available after the projected peak in AIDS mortality rates occurs to offset earlier deficiencies.

Appendix 6, "Key Research Findings" of the Committee on Valuation and Related Areas, discusses more thoroughly such cash-flow analysis issues. Valuation actuaries also should be aware of the "Actuarial Standard of Practice Concerning Cash Flow Testing for Life and Health Insurance Companies" adopted by the Actuarial Standards Boards on October 7, 1988. Finally, actuaries should monitor the work of the NAIC Special Advisory Committee on the Standard Valuation Law, as the NAIC considers implementing the valuation actuary concept into law (see General Bulletin No. 4007 of the American Council of Life Insurance).

As discussed earlier, a decision is needed regarding the use of other funding sources to pay some or all of the AIDS cost. This decision will generally determine whether reserves are and will be adequate. Reduced dividends and increased charges and premiums to recognize the cost of AIDS may be reflected in tests in reserve adequacy. For guaranteed-cost business, the AIDS cost should be fully recognized in tests of reserve adequacy. However,

even where other funding sources are not available to pay for the company's AIDS cost, the reserve adequacy analysis might consider some or all of the previously existing reserve redundancies. The valuation actuary must decide whether these redundancies make additional reserves unnecessary or whether the AIDS costs should be provided for without reducing the adequacy of reserves prior to considering AIDS.

The valuation actuary's analysis may reveal reserve redundancies not expected to be needed for policy-related costs such as projected benefits and expenses. These reserve redundancies may be deemed available to offset the need for additional reserves for AIDS costs. The availability of redundancies for this purpose depends on other needs such as C-1, C-2 and C-3 risks. Consideration may include financial resources remaining to deal with future changes in AIDS mortality, worsening of other mortality and nonmortality factors and shifts in business which may affect redundancies available from other lines of business.

The valuation actuary has alternatives ranging from using no reserve redundancies to using some or all of the redundancies available in lines expected to be affected by AIDS to using some or all redundancies in all lines. Use of redundancies only from affected lines is consistent with the belief that all lines should be evaluated separately for reserve-testing purposes.

Practical Aspects of Reserves and Funding Options

The foregoing discussion refers to responses to expected AIDS claims costs from a solvency standpoint. There are practical considerations as well. As stated before, the company may wish to prefund the costs of AIDS claims to avoid abrupt changes in profits or in dividends and other nonguaranteed elements. Earmarked surplus or additional reserves established from such a prefunding provide for the smoothing of costs as expected AIDS claims increase.

3.6 A New Statutory Valuation Table

Instead of relying on the valuation actuary to test the adequacy of reserves in the face of AIDS, some have suggested that a new statutory valuation mortality table be developed to reflect AIDS mortality. In general, statutory valuation tables are designed to reflect insured mortality and are revised when important and sustainable changes occur. Their function is to help assure that insurers hold reserves with adequate margins for both expected and unforeseen contingencies. The expectation of AIDS mortality costs in

excess of what was anticipated in the existing valuation tables suggests a review of valuation mortality bases, but does not necessarily lead to the conclusion that a new statutory valuation table is necessary.

The main reasons for not creating a new table are absence of credible insured AIDS mortality data, the change in expected AIDS mortality by calendar year for a given age, the shape of the AIDS mortality curve, and the unknown future course of the epidemic. The long period of time needed to develop, gain approval of, and introduce a new valuation table also presents a practical obstacle. For these reasons, the Task Force is not proposing that a new statutory valuation table be constructed. Rather, the Task Force recommends that more dynamic methods of recognizing the cost of AIDS be adopted, methods that permit changes in reserve levels as additional information becomes available. Several such methods are discussed in Section 3.8.

3.7 Selection of Mortality Assumptions for AIDS Reserves

The most common basis for computing regular life insurance reserves on newly issued ordinary life insurance is some form of the 1980 Commissioners Standard Ordinary (CSO) mortality table. The experience mortality table on which the 1980 CSO table is based did not include AIDS death claims to any measurable extent, since the disease had not yet emerged. Thus, as discussed earlier in Section 3.5, additional recognition of AIDS claims costs may be needed, since existing margins may be needed to cover future, still unknown, variations in experience. The degree to which the 1980 CSO table needs to be augmented for new business depends on the analysis of the individual company situation, as performed by the valuation actuary.

For in-force business, the table on which reserves are currently based is the appropriate table to be used, augmented as described above, for additional AIDS mortality. The discussion regarding use of existing margins for AIDS applies here as well.

3.8 Some Alternative Reserve Methods

The Task Force has identified several reserve methods which the valuation actuary may consider if additional reserves are deemed to be warranted. The valuation actuary may wish to consider other methods as well.

3.8.1 *Fund Accumulation*

A simple and pragmatic means of providing for future AIDS claims on a planned basis is the Fund Accumulation Method. This fund, or AIDS Mortality Reserve, is accumulated by using a recursive process similar to funding the future liabilities of a pension plan. The fund may begin at zero or at any initial amount set aside at the beginning of the funding process. For each valuation period, the fund at the beginning of the period is increased by additional contributions to provide for future claims and by interest credited over the valuation period and is reduced by AIDS claims paid during the period. The fund at the end of the period is the AIDS Mortality Reserve at that time and is also used as the fund for the beginning of the next period.

A key element in this process is determining the periodic contribution which will fund future AIDS claims on a reasonable basis. This can be developed by first determining the Present Value of AIDS Mortality (that is, the net single premium representing the present value of future AIDS claims). Next the AIDS Mortality Reserve at the beginning of the valuation period is deducted from the Present Value of the AIDS Mortality; this difference is the Present Value of Unfunded AIDS Claims. An Annuity Factor can be developed for the block as the present value of $1 per $1,000 per year for insurance remaining in force. Dividing the Present Value of Unfunded AIDS Claims by such an Annuity Factor would produce the Level Annual Cost, which is the current year's contribution used in the determination of the AIDS Mortality Reserve described above.

One advantage of this method is that revised assumptions can be directly incorporated into the funding process. For example, as new AIDS mortality rates are developed to reflect emerging experience, these factors can be used immediately in determining the Present Value of AIDS Mortality. Another advantage of this method is that individual company experience will be directly reflected by deducting actual AIDS claims in the recursive development of the AIDS mortality reserve. A company with unfavorable experience will have more deducted and thus more left to fund than would a company with favorable experience. Also, given an AIDS mortality table and other valuation assumptions, present value and annuity factors can be readily calculated by traditional actuarial methods.

This process is described in more detail in Chapter 9, Appendix 1 of the Holland Committee report [reprinted in *TSA* XL, Part II (1988): 1139–40] and is discussed further, including calculation of sample factors, in Holland's presentation "The HIV Epidemic and Topics for the U.S. Valuation Actuary" at the October 1988 Society Meeting. This presentation is available as

a special publication of the Life Insurance Company Financial Reporting Section of the Society of Actuaries.

3.8.2 *Augmented Mortality Reserves*

The customary procedure for valuing death benefits uses a static approach under which the mortality rates are independent of the calendar year of death. However, estimated extra AIDS mortality rates will vary significantly by calendar year. To reflect this variation by creating a new mortality table for each calendar year of issue and then computing different reserve factors by plan and age for each such year of issue would, based on present knowledge, produce a degree of refinement that is more apparent than real and would be administratively difficult. However, the Task Force does believe that valuation-age and/or calendar-year groupings are appropriate, as are various modeling techniques.

By using a prospective reserve formula, the additional mortality reserve could then be computed as the excess, if any, of a reserve based on the regular valuation table (1980 CSO for current issues), augmented by the extra AIDS mortality rates, over the reserve produced by the same table without augmentation.

Additional Reserve Calculation

A simpler procedure, which produces results similar to those produced by the previously described method, is to base the calculation of the *additional* reserve on the present value of future extra AIDS claims costs as described in Section 2.9. From this amount may be subtracted the present value of future premiums or other funds or reserve redundancies dedicated to funding the reserve, over the period of expected extra AIDS mortality.

Net Premiums—Special Considerations

The actuary should give some consideration to the period of years over which the extra AIDS mortality should be funded. If a whole life plan is chosen as representative and the premiums are spread over the entire premium-payment period, the shape of the extra AIDS mortality curve (rising to a peak in the late 1990s and then declining) will produce a deferral of much of the cost to distant future years, rather than providing an appropriate reserve during the remaining years of this century. Accordingly, it may be desirable to shorten the premium payment period so that the reserve build-up is matched to the expected extra mortality cost.

Two ways to deal with this question of the premium-payment period follow. The simpler way is to treat the policy, for the purpose of determining the extra mortality reserve, as if it were, for example, a 15-year-payment life policy instead of a whole-life policy. A more precise method would be to define the valuation net annual premium in the with-AIDS-extra-mortality calculation as follows:

- For policy years after the AIDS claims peak, for example, after 15 years, the valuation net annual premium is equal to the whole-life premium on the same policy using the without-AIDS mortality table.
- For policy years prior to the peak in AIDS claims, a premium computed as the amount sufficient, together with premiums as just defined for later policy years, to mature the policy whenever the insured dies, using the with-AIDS-mortality table.

If we denote those items computed using the with-AIDS table with primed symbols and let unprimed symbols represent those items computed using the without-AIDS table, then the *extra* valuation premium required for the first 15 policy years (except for the first year where CRVM is used), which is labeled P'', is derived from this equation:

$$P''_{x+1} = \frac{\bar{A}'_{x+1} - P_{x+1}\,\ddot{a}'_{x+1}}{\ddot{a}'_{x+1:\overline{14}|}}$$

It should be noted that the 15-year-payment period is given only as an example. The appropriate payment period will vary between different plans of insurance and may change for issues in different calendar years.

Reserve Examples

Examples of the results of using reserve approaches in Section 3.8.2 are contained in Appendix 7. For comparative purposes, reserves are also shown based on factors suggested by the Institute of Actuaries (U.K.) and the Canadian Institute of Actuaries. In these examples, AIDS claim costs are not offset by any margin redundancies. This is not meant to imply that such offsets are inappropriate.

3.9 Financial Statement Considerations—Generally Accepted Accounting Principles

The principal focus of this report is the manner in which the cost of AIDS can be estimated and recognized in life insurance companies' statutory financial statements. In addition, actuaries of life insurance companies that

prepare financial statements in accordance with Generally Accepted Accounting Principles (GAAP) must address this issue within a different context, because the same rules and considerations do not apply.

At present, there are no specific requirements of the actuarial or accounting professions relating to the recognition of the effect of AIDS and GAAP reserves or GAAP financial statements. As a result, each company must evaluate its own circumstances in the context of the general actuarial and accounting rules and guidelines that exist. The following discussion covers certain aspects of this issue to be taken into account by the actuary.

Under the *Financial Acconting Standards Board* (FASB) *Statement No. 60 (FAS 60)*, "Accounting and Reporting By Insurance Enterprises," GAAP reserves, once established, can be strengthened (in light of deteriorating experience) without a change in accounting policy, only in the event that emerging experience suggests that future GAAP losses will occur. This "loss recognition" concept influences the manner in which deviations of experience from the initial reserve assumptions affect reserves. For in-force business, if, after due consideration for the manner in which future dividends and/or nonguaranteed pricing components may be adjusted, the expected cost of AIDS does not exceed the anticipated future GAAP profits, then reserve strengthening would not be appropriate.

If the actuary changes assumptions under *FAS 60* by a means other than through a loss recognition situation, a change in accounting policy would be involved and would require appropriate disclosure. If the company files statements with the Securities and Exchange Commission, such an accounting policy change would have to be a "preferable" method (as discussed in Statement of Auditing Standards No. 58 and Accounting Principles Board Opinion No. 20) of accounting policy in order to be acceptable.

Under the *Financial Accounting Standards Board Statement No. 97 (FAS 97)*, "Accounting and Reporting by Insurance Enterprises for Certain Long-Duration Contracts and for Realized Gains and Losses from the Sale of Investments," the same concept of loss recognition is adopted as in *FAS 60*. In addition, *FAS 97* states that:

> estimates of expected gross profit used as a basis for amortization (of capitalized acquisition costs) shall be evaluated regularly, and the total amortization recorded to date shall be adjusted . . . if actual experience or other evidence suggests that earlier estimates should be revised.

It thus appears that it may be appropriate to incorporate a provision for anticipated AIDS claims in calculations involved in determining the amortization schedule used in the deferral of capitalized acquisition costs for universal life-type products.

Regarding GAAP benefit reserves, some believe that the catastrophic nature of the AIDS epidemic goes beyond the range of events which are expected to be provided for by benefit reserves for in-force policies. Under this line of reasoning, reserves are established to provide for reasonable fluctuations of experience about the most likely experience, not to provide for catastrophic events. Thus, in order to maintain the margins for adverse deviation available in GAAP reserves established in accordance with *FAS 60* prior to the epidemic, or for the most likely assumptions used in the calculation of GAAP reserves established in accordance with *FAS 97*, additional reserves should be established. This logic, however, appears to be in conflict with the FASB statements.

The prior discussion relates to the effect of AIDS and GAAP values for in-force business. GAAP assumptions for new business may appropriately consider the impact of AIDS in establishing reserves for future policy benefits and in the amortization schedules for capitalized acquisition costs.

Each company will need to review its own exposure and determine the proper application of the effect of AIDS on its GAAP financial statement. Those few companies which have recognized the effect of AIDS in GAAP financial statements appear to be accruing reserves in a manner to develop reserves for AIDS which are adequate to provide for the expected extra mortality currently anticipated.

APPENDIX 1

ACKNOWLEDGMENT OF PRIOR EFFORTS TO QUANTIFY INSURANCE COMPANY IMPLICATIONS

AIDS has been recognized as a concern for the life and health insurance industry for only a few years. In August 1987 a paper was released by Michael J. Cowell and Walter H. Hoskins entitled "AIDS, HIV Mortality and Life Insurance." It was issued as a joint special report from the Individual Life Insurance and Annuity Product Development Section, the Life Insurance Company Financial Reporting Section, and the Reinsurance Section and is reprinted in *TSA* XL (1988): 909–972.

This report was widely shared within the actuarial community and provided an important step forward in quantifying the impact of AIDS.

The authors stated in the foreword to this report that:

> Throughout this process, we were keenly aware that we would be presenting our findings long before all of the "facts" became available. Indeed, we recognized that any report on this subject that waited for all the available facts would not be written in time for meaningful action to be taken.

According to Cowell and Hoskins, their intention was to *begin* the work of quantification of the impact of AIDS. They never purported their work to be exact projections but, instead, tried to relay the order of magnitude of the problem, develop methods to analyze the situation, and spur others on to continue research and analysis of the AIDS situation. This they did most effectively.

In March 1988 the *Report of the Society of Actuaries Task Force on AIDS* was released. The report was entitled, "The Impact of AIDS on Life and Health Insurance Companies: A Guide for Practicing Actuaries." [It is reprinted in *TSA* (1988): 839–1159.] It was the report of a task force chaired by David M. Holland. The report was divided into 10 sections. This report gave much information and practical guidance to actuaries. It gave ways to model the impact of AIDS on various forms of insurance and provided guidance to actuaries and insurance company management in responding to the AIDS epidemic.

The Holland task force had as its charge, "The short term assignment of analyzing and reporting on the impact of AIDS and HIV on the solvency of life and health insurance companies." They recognized that additional work was needed and recommended:

> that the Society assign standing committees the responsibility for continuing to monitor the spread of the AIDS and HIV epidemic and responsibility for further analyzing the impact of AIDS on the role of the valuation actuary.

On May 2–3, 1988 a comprehensive symposium entitled "Insurance and the AIDS Epidemic" was held in Chicago, Illinois. It was sponsored by the Society of Actuaries in cooperation with the American Academy of Actuaries, the American Council of Life Insurance, the Canadian Institute of Actuaries, the Canadian Life and Health Insurance Association, and the Health Insurance Association of America. This symposium covered many aspects of AIDS and its impact on life and health insurance.

After the Holland Task Force issued its final report, two additional papers were written by David Holland. These papers gave practical techniques for calculating AIDS mortality rates and applying them to an insured population. Holland's papers were extremely helpful in the work of this Task Force.

The papers were entitled, "Observations on the Human Immunodeficiency Virus Epidemic and Managing Uncertainty in Insurance" (August 1988) and "The HIV Epidemic and Topics for the U.S. Valuation Actuary" (October 1988).

The "Final Report to the ACLI/HIAA CEO Task Force on AIDS by the ACLI/HIAA Ad Hoc Group on AIDS Data" was released on March 1, 1989. The ad hoc group, which was formed in March 1987, coordinated its efforts with our task force and the SOA Committee on HIV Research to construct a general population model of AIDS infections. Their report presents the results of this general population model and presents the financial effect of AIDS on the life and health insurance industry, including the impact on individual companies.

Work of Actuaries in Other Countries

Significant work on AIDS has been done in foreign countries. In addition to numerous international conferences on AIDS, specific recommendations have been developed by actuaries in the United Kingdom and Canada. In the United Kingdom, Bulletins 1 through 4 were developed which called for the immediate establishment of reserves for AIDS. Bulletin 1 was issued in September of 1987 and was a background paper on AIDS. Bulletin 2 was issued in December 1987 and was followed by a supplement on February 1, 1988. Bulletin 2 dealt with modeling AIDS deaths and providing reserving and pricing advice, relative to insurance, to actuaries. Bulletin 3 dealt with health coverages and was issued in June 1988. Bulletin 4 was released in March 1989. It updated earlier AIDS data and revised downward some of the projections.

In November 1988 the Canadian Institute of Actuaries issued "1988 Guidance Notes for Valuation Actuaries." It contained:

> specific recommendations to Valuation Actuaries outlining procedures for setting reserves for AIDS claims at the end of 1988 for Ordinary life insurance... . These notes are very much intended as an interim measure to provide assistance to Valuation Actuaries at the end of 1988. The methods proposed are not necessarily the ones the Sub-Committee would recommend had it had sufficient time to fully consider all the ramifications of valuing AIDS in a more theoretically-correct manner. However, the Sub-Committee believes that the recommended solutions will provide a sound approximation to the eventual reserves that will be required for AIDS.

In addition, two other Canadian reports were issued, namely, the "First Report of the CIA Task Force on AIDS Subcommittee on Modelling,"

which dealt with modeling for life insurance in Canada only, and the "Second Report of the CIA Task Force on AIDS, Subcommittee on Modelling: An Analysis of U.S.A. Data."

It should be noted that the recommendations developed in these countries are a significant recognition of and response to the financial implications of AIDS. The interested reader may wish to read some or all of these publications.

APPENDIX 2

RELATIONSHIP BETWEEN POPULATION DATA AND INSURANCE COMPANY DATA

To determine the relationship between general population data and insurance company data, the Task Force made use of the ACLI/HIAA AIDS-Related Claims Surveys of 1986 and 1987 and the middle scenario male mortality rates from the report of the SOA Committee on HIV Research.

The Task Force first calculated expected deaths by number of contracts in the insured population by applying AIDS mortality rates to estimates of contracts in force by age group, as detailed in Table 2-1. These were then related to the actual death claims in the survey grossed up to 100 percent of industry-wide claims, reflecting the fact that the survey covered companies representing 69 percent of total industry death claims in 1986 and 65 percent in 1987.

TABLE 2-1

MALE U.S. POPULATION AND LIFE CONTRACTS IN FORCE BY AGE

Age Range	1986 U.S. Male Population*	Percentage of Owners†	Number of Male Owners	Average Number Contracts per Owner‡	Number of Contracts In Force 1/1/87§
18–24....	14,139	46%	6,504	1.2	7,805
25–34....	21,567	51	10,999	1.4	15,399
35–44....	16,357	65	10,632	1.6	17,011
45–54....	11,085	61	6,762	1.7	11,495
55–64....	10,456	64	6,692	1.7	11,376
65+	11,823	57	6,739	1.5	10,109
Total...	85,427	56	48,328	1.5	73,195

*From 1988 "Statistical Abstract," p. 13 (in thousands).
†From 1988 ACLI "Fact Book," p. 37 (percentage of males owning individual life insurance).
‡From one company's in-force data.
§Estimated based on 143,247 thousand ordinary life contracts in force as of 12/31/86 (1987 "Fact Book" Update, p. 11) with an estimate that 51 percent of total contracts are owned by adult males.

TABLE 2-1—*Continued*

MIDDLE SCENARIO
GENERAL POPULATION MALE
AIDS MORTALITY RATES

Age Range	Central Age	1986	1987
18–24.....	22	0.026	0.041
25–34.....	30	0.154	0.238
35–44.....	40	0.177	0.265
45–54.....	49	0.107	0.161
55–64.....	59	0.044	0.069
65+	68	0.016	0.025

ACTUAL AND EXPECTED AIDS CLAIMS
BY NUMBER OF INDIVIDUAL LIFE CONTRACTS

	Actual*	Expected†	A/E
1986.....	3,060	7,478	41%
1987.....	5,560	11,381	49
1986–87.....	8,620	18,859	46

*Actual claims are from the 1986 and 1987 ACLI/HIAA AIDS Claims Surveys grossed up to industry-wide AIDS claims numbers because the survey covered companies representing 69 percent of the total industry individual life death claims in 1986 and 65 percent in 1987.
†Expected AIDS mortality rates are stated above. The number of contracts exposed was assumed not to increase from 1986 to 1987.

Expected deaths by amount were calculated by applying AIDS mortality rates to the 1986 and 1987 estimated in-force amounts. These were obtained by adjusting the 1/1/87 estimates from the Cowell/Hoskins paper to reflect in-force amounts as of mid-1986 and mid-1987 (see Exhibit 2). Again, there was a gross-up as described above.

TABLE 2-2

AMOUNT OF INDIVIDUAL INSURANCE IN FORCE IN U.S.
(MALES ONLY)

Age Range	Cowell's 1/1/87 Estimate (billions)	Life Insurance Amounts Exposed* (billions)	
		During 1986	During 1987
20–29.....	$ 658	$ 621	$ 697
30–39.....	675	637	715
40–49.....	505	476	535
50–59.....	277	261	294
20–59.....	$2,115	$1,995	$2,241

*Estimated from Cowell's amounts assuming a 12 percent increase from 1986 to 1987. Amounts exposed are mid-year values.

TABLE 2-2—*Continued*

MIDDLE SCENARIO
GENERAL POPULATION MALE
AIDS MORTALITY RATES

Age Range	Central Age	1986	1987
20–29.....	26	0.086	0.136
30–39.....	34	0.192	0.294
40–49.....	44	0.149	0.221
50–59.....	54	0.068	0.105

ACTUAL AND EXPECTED AIDS CLAIMS
BY NUMBER OF INDIVIDUAL LIFE CONTRACTS

	Actual*	Expected†	A/E
1986.....	$ 93.3	$264.4	35%
1987.....	130.8	454.3	29
1986–87.....	224.1	718.7	31

*Actual claims are from the 1986 and 1987 ACLI/HIAA AIDS-Related Claims Surveys grossed up to industry-wide AIDS claim amounts because the survey covered companies representing 69 percent of the total industry's individual life death claims in 1986 and 65 percent in 1987.
†Expected AIDS mortality rates are stated above.

Because of the groupings of underlying population data, different age combinations were required for the two calculations. Since several approximations were used in determining these estimates, the results shown below should be taken as suggestive rather than definitive.

ACTUAL-TO-EXPECTED PERCENTAGES

	1986	1987	Overall
By Number	41%	49%	46%
By Amount	35	29	31

APPENDIX 3

THE TASK FORCE INTERCOMPANY STUDY

GEOGRAPHICAL DIFFERENCES IN AIDS MORTALITY LEVELS AMONG INSURED LIVES

The CDC reports of AIDS cases show a significant geographical variation in AIDS incidence in the general population. Tables in the monthly CDC report show the AIDS incidence rates per 100,000 population on a reported

basis for each of the prior two years by state and the same statistics for each metropolitan area with 500,000+ population. However, it is not clear to what extent these geographical differences can also be expected among insured lives. Therefore, the Task Force conducted an intercompany study of AIDS death claims and individual life insurance in force by state in order to better determine the state variations among insured lives. This was also conducted to verify the reasonability of the results obtained in Appendix 2, since the calculations underlying the results in Appendix 2 contained several approximations. Contributors to the Task Force study were Aetna Life and Casualty, Equitable Life Assurance Society/EVLICO, Franklin Life Insurance Company, Metropolitan Life Insurance Company, New York Life Insurance Company, Northwestern Mutual Life Insurance Company, Prudential Insurance Company of America, State Farm Life Insurance Company, and Transamerica Occidental Life Insurance Company.

The Task Force study compared actual and expected 1986, 1987, and 1988 AIDS claims by number and amount from the nine companies. Actual AIDS claims were assigned to calendar years based on the incurred rather than the paid date, whenever possible. Data were reported separately for each of the nine states with the highest number of AIDS cases and on a combined basis for all other states. The expected claims were obtained by applying middle scenario male population AIDS mortality rates (Table 5) to individual life insurance in force for males, ages 20 through 54, by five-year attained-age groups, using the AIDS mortality rates for the central age in each group. Since the expected AIDS mortality rates vary by calendar year as well as attained age, they were applied separately to the life insurance exposures for each calendar year. The expected AIDS claims for a given year and company were distributed by state using the state distribution of total in force for that company.

The comparison of actual/expected AIDS claims is shown in Tables 3-1, 3-2, 3-3, and 3-4. The actual/expected AIDS mortality ratios were calculated both by number of contracts and by face amount. Note that the actual/expected ratios by number are consistently higher than those by amount, the same result as found in Appendix 2. Also note that the ratio by number declined less than the ratio by amount during the three year period.

The tables also compare the actual/expected ratios for each state-to-average for all states combined. The nine states separately examined have state-to-average ratios quite different from the state to average ratios based on CDC AIDS case incidence rates. For example, New York and New Jersey show lower state-to-average ratios in this insured lives study than they show for

the AIDS incidence rates in the general population. This may be due to a greater percentage of AIDS cases in those states from IV drug users. Additionally, in New York City, greater underreporting to insurance companies may occur because death certificates show only whether death is due to normal or violent causes. No other information is given. On the other hand, Texas and Illinois show higher state-to-average ratios than the CDC numbers indicate. Again, this may be a reflection of differences between the insured lives and the general population.

As a group, the nine highest-case states show an insured state-to-average ratio of 1.43 by number and 1.41 by amount for the combined three-year period. This compares to the general population state-to-average ratio of 1.57 when the CDC's AIDS incidence rates for the period February 1987 through January 1989 are used. This indicates that the geographical differences among insured lives are somewhat less than those in the general population, but are still significant.

TABLE 3-1

ACTUAL/EXPECTED AIDS CLAIMS
1986

	Actual Claims		Expected Claims		A/E Ratio		State-to-Average	
Total	Number	Amount	Number	Amount	Number	Amount	Number	Amount
California	141	$4,867,949	132	$6,991,826	107.0%	69.6%	2.68	2.41
Florida	40	681,869	63	2,621,992	63.9	26.0	1.60	0.90
Georgia	15	238,903	20	755,172	75.7	31.6	1.90	1.10
Illinois	31	2,419,197	122	3,923,834	25.4	61.7	0.64	2.14
Massachusetts	4	7,563	30	633,641	13.5	1.2	0.34	0.04
New Jersey	38	365,889	68	2,504,500	56.3	14.6	1.41	0.51
New York	113	2,848,864	169	5,998,438	67.0	47.5	1.68	1.65
Pennsylvania	37	538,272	111	3,086,541	33.4	17.4	0.84	0.60
Texas	39	970,339	59	3,400,660	66.2	28.5	1.66	0.99
9 State Subtotal	458	$12,938,845	772	$29,916,514	59.3%	43.2%	1.49	1.50
All Others	227	5,491,408	947	33,976,439	24.0	16.2	0.60	0.56
All States	685	$18,430,253	1,719	$63,892,953	39.9%	28.8%		

TABLE 3-2

ACTUAL/EXPECTED AIDS CLAIMS
1987

	Actual Claims		Expected Claims		A/E Ratio		State-to-Average	
Total	Number	Amount	Number	Amount	Number	Amount	Number	Amount
California	191	$7,279,849	199	$12,129,004	96.2%	60.0%	2.52	2.37
Florida	59	1,139,794	95	4,598,510	62.0	24.8	1.62	0.98
Georgia	24	551,962	31	1,332,514	78.3	41.4	2.05	1.64
Illinois	41	710,723	182	6,764,767	22.5	10.5	0.59	0.42
Massachusetts	6	171,531	44	1,146,163	13.7	15.0	0.36	0.59
New Jersey	76	1,026,950	100	4,439,507	75.6	23.1	1.98	0.91
New York	136	3,113,120	251	10,468,232	54.2	29.7	1.42	1.18
Pennsylvania	44	1,154,422	166	5,372,746	26.6	21.5	0.70	0.85
Texas	76	2,416,149	89	5,879,819	85.0	41.1	2.23	1.63
9 State Subtotal	653	$17,564,500	1,157	$52,131,261	56.4%	33.7%	1.48	1.33
All Others	333	10,370,310	1,424	58,342,686	23.4	17.8	0.61	0.70
All States	986	$27,934,810	2,581	$110,473,947	38.2%	25.3%		

TABLE 3-3

ACTUAL/EXPECTED AIDS CLAIMS
1988

	Actual Claims		Expected Claims		A/E Ratio		State-to-Average	
Total	Number	Amount	Number	Amount	Number	Amount	Number	Amount
California	266	$7,531,706	365	$22,746,293	72.9%	33.1%	2.33	1.93
Florida	80	2,573,571	189	8,916,772	42.4	28.9	1.36	0.68
Georgia	21	481,364	45	2,164,021	47.1	22.2	1.51	1.29
Illinois	100	2,479,064	341	12,943,713	29.3	19.2	0.94	1.11
Massachusetts	12	55,614	61	1,921,456	19.7	2.9	0.63	0.17
New Jersey	135	1,371,017	231	10,080,573	58.5	13.6	1.87	0.79
New York	165	3,642,809	505	21,888,621	32.7	16.6	1.05	0.97
Pennsylvania	100	1,450,326	395	12,041,079	25.3	12.0	0.81	0.70
Texas	110	6,023,281	159	10,667,273	69.1	56.5	2.21	3.28
9 State Subtotal	989	$25,608,752	2,290	$103,369,801	43.2%	24.8%	1.38	1.44
All Others	539	10,801,553	2,603	108,403,051	20.7	10.0	0.56	0.58
All States	1,528	$36,410,305	4,893	$211,772,852	31.2%	17.2%		

TABLE 3-4

ACTUAL/EXPECTED AIDS CLAIMS
1986–1988

	Actual Claims		Expected Claims		A/E Ratio		State-to-Average	
Total	Number	Amount	Number	Amount	Number	Amount	Number	Amount
California	598	$19,679,504	695	$41,867,123	86.0%	47.0%	2.47	2.19
Florida	179	4,395,234	346	16,137,274	51.0	27.2	1.48	1.27
Georgia	60	1,272,229	95	4,251,708	63.1	29.9	1.81	1.40
Illinois	172	5,608,984	645	23,632,314	26.7	23.7	0.77	1.11
Massachusetts	22	234,708	134	3,701,260	16.4	6.3	0.47	0.30
New Jersey	249	2,763,856	399	17,024,580	62.4	16.2	1.79	0.76
New York	414	9,604,793	925	38,355,291	44.8	25.0	1.29	1.17
Pennsylvania	181	3,143,020	671	20,500,275	27.0	15.3	0.78	0.72
Texas	225	9,409,769	308	19,947,752	73.2	47.2	2.10	2.20
9 State Subtotal	2,100	$56,112,097	4,218	$185,417,578	49.8%	30.3%	1.43	1.41
All Others	1,099	26,663,271	4,974	200,722,175	22.1	13.3	0.63	0.62
All States	3,199	$82,775,368	9,192	$386,139,753	34.8%	21.4%		

APPENDIX 4

AIDS INCIDENCE VARIATION BY STATE

THOMAS W. REESE

The AIDS epidemic clearly varies widely by geographic region. For example, of the cases reported to the Centers for Disease Control (CDC) in the year ending March 1989, New York reported 37.5 diagnosed AIDS cases per 100,000 population, while New Jersey reported 30.9 cases, Florida reported 24.2 cases, and California reported 20.9 cases per 100,000 population. During the same period, 23 states reported less than 5 cases per 100,000 population.

Further, the incidence of AIDS cases is higher in metropolitan areas than in rural areas. The reported incidence rate for metropolitan areas with populations of 500,000 or more was 19.3 cases per 100,000 population, while the incidence rate for nonmetropolitan areas was only 5.1 cases. The San Francisco Metropolitan Statistical Area (MSA) reported 99.7 AIDS cases per 100,000 population in the last year; the Jersey City MSA reported 75.7 cases; and the New York City MSA reported 67.3 cases per 100,000 population.

Projections of insurance company AIDS claims must take these geographic variations into account. The incidence of AIDS claims would certainly be expected to be higher for a company marketing more heavily in high-AIDS-incidence areas than for one marketing mainly in low-incidence areas, all other factors being equal.

Developing State AIDS Incidence Multipliers

A projection of AIDS claims involves the application of AIDS claim rates to the net amounts of coverage at risk. Some modification should be made to account for the variation of those claims rates by geographic region.

The most direct way to account for geographic variation is to use relative multipliers by state of residence. In-force coverage amounts by state are usually already available.

The AIDS-incidence multiplier for a state could be calculated by dividing the state's AIDS incidence rate by the national incidence rate. The AIDS incidence rate is the number of AIDS cases divided by the state population.

Such multipliers for each state could readily be calculated from the AIDS reporting rates published monthly in the CDC HIV/AIDS Surveillance Report.

For example, 12.8 AIDS cases per 100,000 U.S. total population were reported in the past year. Since New York reported 37.5 cases per 100,000 population, the AIDS claims rate for New York business could be set to be 293 percent (37.5 divided by 12.8) of the average national claims rates. Similar multipliers would be 241 percent for New Jersey, 189 percent for Florida, and 163 percent for California.

Problems with the CDC Report Data

Using the unadjusted CDC AIDS incidence data to develop state AIDS incidence multipliers would be inadequate in several ways, however:

1. It is not appropriate to include all AIDS cases in the calculation of the ratio. Most notably, intravenous drug user (IVDU) cases have little effect on insured claims. IVDU cases represent about 27 percent of AIDS cases reported to date. These cases are not distributed uniformly by state and should be removed from the calculation of relative state factors.

   Removing IVDU cases (and other cases, as explained later) reduces the relative multipliers for states like New York and New Jersey that have disproportionately high numbers of IVDU AIDS cases. Similarly, the relative multipliers are increased for states like California that have relatively low IVDU AIDS case percentages.
2. The AIDS epidemic is not progressing uniformly through all geographic areas at the same time. For example, 42 percent of the non-IVDU AIDS cases diagnosed through 1982 were residents of Standard Metropolitan Statistical Areas (SMSA—with population of one million or more) in the northeastern U.S. By 1988, however, this proportion had dropped to only 23 percent. Correspondingly, only 14 percent of non-IVDU cases diagnosed through 1982 resided outside of an SMSA of one million or more population. By 1988, this proportion had grown to 22 percent.

The AIDS epidemic is really a series of smaller epidemics. HIV infection was introduced earlier, and spread faster, in some areas than in others. As future AIDS case reporting reveals the relatively later spread of HIV infection to other areas of the country, the relative distribution of cases will change.

AIDS incidence factors by state must take such AIDS case trends into account. The multipliers should be based on the estimated incidence of future AIDS cases instead of on the early cases already seen.

3. AIDS case trends should be based on the cases *diagnosed*, rather than on the cases *reported*, in each time period. The reporting of cases is not uniform, and states have "surges" of reporting that are not related to AIDS incidence trends.
4. The CDC's incidence rates are calculated by dividing the reported AIDS cases by the total state population. The use of the total population can distort the results needed for insurance claim projection purposes. Instead, the AIDS cases should be compared to a population statistic weighted to take account of the relative different incidences of the AIDS epidemic by age and sex group.

Unfortunately, data that satisfy these requirements are hard to obtain. The CDC's monthly reports do not separate AIDS cases by both state and exposure category. Further, the monthly reports separate cases by period of reporting, not diagnosis. The CDC's quarterly AIDS Public Information Data Set (PIDS) diskette includes much additional information but does not identify cases by state.

New Data Available

A new addition to the CDC's AIDS Public Information Data Set has recently made available: a set of frequency tables and cross tabulations that are distributed on microfiche. These tables greatly expand the existing data.

The microfiche contain tables that separate all reported cases by state or by MSA. There are over 10,000 of these tables! A subset of the tables that separate data by state was studied to suggest state AIDS incidence multipliers for use in projecting insured lives AIDS claims.

For each state, the reported AIDS cases are sorted in separate tables for each of eight variables. Where there are enough cases (explained below), tables are included for each cross-tabulation of two and three of these variables. The study reported below was based on tables related to two of these variables: "half-year of AIDS diagnosis" and "patient group."

The cross-tabulation data are often quite limited as the CDC is concerned about confidentiality of case data. For states with fewer than 100 reported AIDS cases (AK, ID, ME, MT, NE, NH, ND, SD, VT, WV, and WY), no cross-tabulation between variables was provided. For all tables, any data cell containing five or fewer cases was left blank.

Therefore, the data presented in this study do not give a completely accurate count of the cases in each category. However, the deficiencies are generally minor and still allow a better derivation of state AIDS incidence multipliers than has been possible before.

Study Conducted

These newly available data were used to develop suggested state AIDS incidence multipliers. The study used the microfiche set containing AIDS cases reported through the end of 1988.

The study was conducted for AIDS case diagnosis years 1986 through 1988. Earlier years were not included because relatively few cases were reported and the resulting elimination of cells with five or fewer cases significantly distorted the results.

The AIDS cases shown for each half-year of diagnosis were adjusted by subtracting the cases (where shown) for the cross-tabulation of that half-year of diagnosis with certain patient groups. The patient groups removed were IVDU cases, homosexual-IVDU cases, hemophiliacs, pediatric (under age 13) cases, and persons born outside of the U.S. For various reasons applying to each group, these cases generally do not affect insured life and disability insurance claims.

The AIDS case data were weighted based on the population in each state. State population data came from the estimated 1986 population published in "Projections of the Population of States by Age, Sex, and Race: 1988 to 2010," U.S. Dept. of Commerce publication series P-25, No. 1017.

Instead of using the entire population in each state, only the population for males aged 20 through 59 was used; this is considered more representative of the population related to the AIDS epidemic. To make the population for each state even more relevant to the age distribution of the AIDS epidemic, the populations in various age groups were weighted together as follows:

Age in 1986	Weighting Percentage
20–24	5%
25–29	15
30–34	25
35–39	20
40–44	15
45–49	10
50–54	5
55–59	5

Results

Table 4-1 shows the results of this study of state AIDS incidence factors. The first column shows a "suggested" multiplier to use for each state. For example, AIDS claims on company coverage in Alabama would be projected using 60 percent of the estimated average national AIDS claims rates.

These multipliers are based on the other data presented in the table, including some modifications based on trends for certain states. In most cases, the suggested multiplier is consistent with the multiplier that would be directly calculated for all years of diagnosis combined. For certain states, however, a projection was made based on an apparent trend. The most notable examples are:

CALCULATED MULTIPLIER

State	Cases Diagnosed in All Years	1986	1987	1988	Suggested Multiplier
Alabama	33%	25%	39%	59%	60%
California	210	214	196	190	180
Colorado	78	80	83	95	100
Dist. of Col.	802	727	795	892	900
Florida	168	152	172	189	200
Georgia	108	105	117	127	130
Kentucky	18	15	19	37	40
Missouri	59	63	69	75	80
Nevada	83	92	113	129	110
New York	278	275	223	217	200
Ohio	38	33	41	52	60

For other states, incidence trends were used mainly to decide in which direction to round the suggested multiplier (the suggested multipliers were rounded to a multiple of 10 percent).

Relatively minor use was made of trend patterns to forecast future relative state incidence rates. This is probably appropriate for the next few years of AIDS claims. For longer-term projections, however, it could be expected that the state multipliers will become "more level." That is, the highest multipliers should decrease and the lowest multipliers should increase, so that long-term multipliers should be closer to 100 percent than they are now.

Notes

Caution must be used in interpreting the reported AIDS case figures in the table. These data are not accurate due to the CDC's decision not to

TABLE 4-1

AIDS CASES REPORTED THROUGH THE END OF 1988, EXCLUDING IV DRUG USERS, HEMOPHILIACS, PEDIATRICS, AND PERSONS BORN OUTSIDE THE U.S.

State	Suggested State AIDS Incidence Multiplier	Year of Diagnosis				Weighted State Population Factor (Thousands)	Multiplier Based on April 1989 CDC Report*
		1986	1987	1988	All		
AL	60%	49	107	133	299	140	42%
AK	30	17	10	10	41	25	21
AZ	70	130	196	116	519	119	52
AR	40	31	62	52	132	78	25
CA	180	3,216	4,048	3,240	14,393	1,061	163
CO	100	155	222	211	691	137	69
CT	80	130	145	150	516	115	105
DE	80	32	35	40	92	23	101
DC	900	248	373	346	1,248	24	673
FL	200	831	1,290	1,177	4,184	386	189
GA	130	332	510	457	1,561	223	119
HI	100	70	84	74	251	42	65
ID	10	0	7	0	19	36	9
IL	80	421	591	538	1,915	417	68
IN	30	79	124	41	281	197	25
IA	20	20	29	33	81	100	15
KS	40	49	63	56	159	89	23
KY	40	29	49	79	157	133	20
LA	90	186	310	201	873	160	70
ME	30	20	30	18	71	42	24
MD	110	230	337	285	1,053	169	106
MA	100	250	406	328	1,219	213	99
MI	40	118	201	215	614	331	40
MN	50	91	134	142	392	157	34
MS	50	47	64	68	168	85	42
MO	80	156	235	212	667	176	62
MT	10	8	7	7	15	31	11
NE	20	18	30	33	69	57	22
NV	110	52	88	83	215	40	118
NH	40	17	33	28	69	39	30
NJ	130	447	627	566	2,180	269	241
NM	50	32	50	43	114	54	29
NY	200	2,413	2,693	2,160	11,138	620	293
NC	30	107	176	128	474	231	37
ND	10	0	0	0	0	25	5
OH	60	176	300	319	918	379	37
OK	50	56	108	91	258	119	36
OR	70	72	156	110	373	106	48
PA	60	373	514	385	1,617	410	62
RI	70	41	50	33	116	35	72
SC	50	56	92	98	268	122	43
SD	10	0	0	0	0	24	8
TN	50	74	155	143	404	172	45
TX	120	1,048	1,617	1,171	4,784	626	100
UT	40	30	49	41	108	57	35
VT	20	0	16	0	24	21	16
VA	50	180	258	151	764	225	52
WA	80	218	291	224	880	180	67
WV	10	7	19	14	45	67	10
WI	30	54	96	79	249	172	20
WY	10	0	0	0	0	22	15
Totals	100%	12,416	17,087	14,129	56,678	8,776	100%

*"CDC Report" state multiples are the ratio of the rate, per 100,000 population, of AIDS cases reported in the past 12 months for the state to the rate for the total U.S.

include cells of five or fewer cases and not to calculate any cross-tabulations for states with fewer than 100 reported AIDS cases. There are no AIDS cases shown for North Dakota, South Dakota, and Wyoming, not because there are no cases, but because the cases were spread "too thinly" among the various cells to appear on the microfiche reports.

There was relatively little overall distortion caused by the fact that some microfiche data cell entries are blank for CDC confidentiality reasons. Of the 61,821 U.S. AIDS cases diagnosed in 1986 through 1988 and reported by the end of 1988, 61,709, or 99.8 percent, were included in the microfiche tabulation by half-year of diagnosis. Therefore, only 112 cases were "lost" in this tabulation due to the CDC's rules.

The cross-tabulation by both half-year of diagnosis and patient group contained 59,279 cases diagnosed in 1986 through 1988. This is 95.9 percent of the total 61,821 cases that would have been shown without the confidentiality restrictions. Thus, approximately 4 percent of the total cases were lost in this more detailed tabulation. The lost data tended to overstate the multipliers for some states with smaller numbers of AIDS cases. This occurred because the "excluded patient group" cases were not fully subtracted from the data for some states. Adjustments were made in the suggested state multipliers to correct for this distortion.

The cases in the "all years" category of the table are sometimes less than the sum of the cases diagnosed in 1986, 1987, and 1988. This anomaly results because of the CDC's rule to delete any cross-tabulation cell that has five or less cases. The figures for cases diagnosed in a specific year are the cells tabulated only by half-year of diagnosis minus the excluded patient groups in the cells tabulated both by half-year of diagnosis and by patient group. Thus the figures for specific diagnosis years often have not removed the excluded patient group cases because they fell in cells with five or fewer cases. The figures for "all years," on the other hand, are taken from the cells tabulated only by patient group. Thus the "all years" figures more correctly remove the excluded patient group cases, since it is more likely that cells in this tabulation contain more than five cases.

There are only 14,129 AIDS cases shown as diagnosed in 1988, fewer than the 17,087 diagnosed in 1987. This does not indicate a reduction in diagnosed AIDS cases in 1988. Rather, it occurs because the data include only cases reported through the end of 1988. The reporting is more complete for 1987 than it is for 1988 diagnosed cases. Future reporting will soon produce more cases diagnosed in 1988 than in 1987.

Since the suggested state multipliers take AIDS case incidence trends into account, these multipliers should be used with caution when trying to validate past AIDS claims frequencies by state. For example, the suggested multiplier for New York, 200 percent, is significantly different than the multiplier that would have been calculated for AIDS cases diagnosed in 1986, 275 percent. Further, note that AIDS cases diagnosed in 1986 will be mostly seen as life insurance AIDS claims in 1987 through 1989, not in 1986.

APPENDIX 5

GEOGRAPHIC IMPACT FACTORS

JAMES B. KELLER

In the paper, "Mortality Expectations Based on HIV-Infection Status at Time of Underwriting" [1], a formula was given to determine a "geographic impact factor," which is shown below:

$$GIF = c_1 \times (b_1/a_1) + c_2 \times (b_2/a_2) + \ldots + c_{50} \times (b_{50}/a_{50})$$

where

GIF = geographic impact factor
a_1 = the percent of the ordinary insurance written in state #1
a_2 = the percent of the ordinary insurance written in state #2, etc.
b_1 = the percent of sero+ individuals in state #1
b_2 = the percent of sero+ individuals in state #2, etc.
c_1 = the percent of business a company writes in state #1
c_2 = the percent of business a company writes in state #2, etc.

It is difficult to determine the percent of individuals who are sero+ in any particular state. More specifically, it would be desirable to know the percent of sero+ individuals in a particular state who are IV drug users, to exclude them from our calculations. Data are available from the CDC on AIDS cases reported by state. If IV drug use among AIDS patients was similar in all states and if the epidemic was in the same stage in all states, one might be able to just use a state's percentage of AIDS cases as representing that state's percentage of sero+ individuals with the IV drug users removed. Unfortunately, this is not the case. In some states, such as California, New York, Texas, and Florida, the epidemic has progressed further due to an earlier start. Also, some states (such as New York) have a higher proportion of AIDS cases due to IV drug use than do others.

To adjust for the epidemic starting in different areas and different times, a method similar to that presented in Mike Zurcher's paper entitled "Modeling the Impact of HIV on Group Insurance Plans" [2] was utilized. This entails classifying states into four different cells based on the likely start of the epidemic in that state. New York, California, New Jersey, and Washington, D.C., are assumed to constitute the first group of states involved in the epidemic starting as early as 1975. Florida and Texas constitute a second group entering the epidemic in 1977. The third group has the states of Illinois, Pennsylvania, Georgia, and Massachusetts entering in 1978; all other states are put into the fourth group entering in 1980.

The above model was then utilized to determine the relationship of recent AIDS cases to HIV positive. This relationship increases the farther out in the epidemic one goes. Therefore, recent AIDS cases represent a much smaller percentage of the corresponding HIV-infected population for those states that started in the epidemic later. A normalization factor is calculated to convert the percent of AIDS cases in a particular state to the percent HIV infected in that state.

The next adjustment utilized is to remove the IV drug users by state. The CDC categorizes AIDS patients by risk category, two of which are: IV drug abuser and homosexual male/IV drug abuser. We remove these two groups from our calculations, since we presume that these individuals are unlikely to be insurance buyers. The CDC does not release data by state on these categories. However, they do produce a diskette that separates the categories by region of the country. Utilizing the data from the most recent diskette (2Q, 1988), the percentage of AIDS cases that are IV drug users in a particular state was estimated. By using these various pieces we can arrive at the geographic impact factor for a particular state. Table 5-1 includes the percentage of AIDS cases in a particular state, the percentage of insurance sold in that state, the normalization factor, the assumed percentage involving IV drug users, and the state geographic impact factor for each of the top ten states and the remaining states.

TABLE 5-1

State	Percentage Recent AIDS Cases	Norm Factor	Percentage IV	Percentage Sero +	Percentage Insurance	State Factor
New York	22.2	0.769	46.0	12.5	7.0	1.783
California	20.7	0.769	18.0	17.7	11.8	1.498
Florida	7.8	0.959	21.0	8.0	4.8	1.645
Texas	7.6	0.959	21.0	7.8	8.3	0.933
New Jersey	6.3	0.769	46.0	3.5	3.5	1.005
Illinois	2.9	1.074	21.0	3.4	4.7	0.723
Pennsylvania	2.7	1.074	21.0	3.1	4.5	0.695
Georgia	2.3	1.074	21.0	2.7	3.1	0.878
Massachusetts	2.1	1.074	21.0	2.4	2.4	1.039
DC	2.0	0.769	21.0	1.6	0.3	5.319
All	100.0	1.000	26.0	100.0	100.0	1.000
Top 10	76.8	0.847	28.7	62.7	50.4	1.245
All But Top 10	23.2	1.506	21.0	37.3	49.6	0.752

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APPENDIX 6

COMMITTEE ON VALUATION AND RELATED AREAS KEY RESEARCH FINDINGS OCTOBER 1988

During the last several years, the Committee on Valuation and Related Areas (COVARA) has directed research which has resulted in the development of improved techniques for understanding and evaluating risk in an insurance company. Primarily conducted by COVARA's C-1, C-2, C-3, and Combination of Risk Task Forces, detailed discussions of the methods and procedures are included throughout the Society's literature and were presented in summary form by each Task Force at the Society's 1987 Annual Meeting. The purpose of this paper is to present the major findings of this research and to assess the broad implications of these findings, with particular focus on the valuation function in an insurance company.

The Valuation Model

The historical valuation model focuses solely on liabilities and is based on an idealized series of cash flows defined by the reserve assumptions and methods chosen by the actuary from the range permitted by regulatory authorities. It has long been recognized that actual cash flows were likely to develop substantially different from those assumed in the valuation. In fact, such differences are commonly reflected in pricing. Nonetheless, in a stable financial environment, during which asset values remain reasonably constant, the historical valuation model generally produces reasonable and perhaps overly conservative results. In a volatile financial environment, however, reserve adequacy cannot be presumed.

Recent COVARA research, conducted during a period of unprecedented interest rate volatility, clearly invalidates the historical valuation model. It has been demonstrated that mismatch risk, which depends on the relationship of asset and liability cash flow, can overwhelm the conservatism contained in statutory reserves developed for more stable times. The presence of other risks, including asset default and impairment and general pricing uncertainty, further erode the presumed conservatism of reserves computed under the historical valuation model. It follows that only by understanding the interaction of asset and liability cash flows can a judgment be made about reserve adequacy. The valuation model of the future must be built on a foundation that clearly recognizes insurance as a cash-flow business and will require an understanding of the behavior of these cash flows to responsibly discharge the valuation function.

Principal Findings

1. Insurance is fundamentally a cash-flow business.

While this finding is hardly original or profound, recognition of the cash-flow nature of the insurance business is at the heart of subsequent findings. The implication of this finding extends to all aspects of the management of an insurance company, but it has particular significance to the valuation function.

2. Risk in an insurance company represents deviations from expected cash flows.

Risk analysis and management are central to the successful management of an insurance company. Thus, the implication of this finding is very broad and requires senior management, as well as the valuation actuary, to understand both the potential for deviations from expected cash flow and their magnitude. Conceptually, product prices and/or valuation reserves should increase as the potential for deviation increases.

3. The adequacy of reserves held under any valuation system is dependent on both asset and liability cash flows.

This finding requires a fundamental change in the way valuation actuaries traditionally have assessed the adequacy of valuation reserves. Assets no longer can be ignored. Asset cash flows are equally important as liability cash flows, and it is the relationship between these cash-flow streams (under reasonably anticipated future conditions) that ultimately determines reserve adequacy. In this context, the adequacy of reserves is defined as the range of future conditions over which the reserve maintained is judged to be sufficient.

4. Cash-flow analysis is an effective means to assess reserve adequacy.

This finding has a major impact on the practical work of the valuation actuary and the responsibilities of the valuation actuary in rendering an opinion on reserve adequacy. For most insurance products and investments, expected cash flows will change under different experience assumptions. Cash-flow analysis reveals the implications of such changes and permits an objective assessment of the range of future experience conditions where reserves will be adequate. While detailed cash-flow analysis may not be necessary in all instances, and may not always be explicit, any judgment about reserve adequacy must be based on a firm understanding of the underlying asset and liability cash flows.

5. Reserve adequacy must be assessed in the context of surplus and other risk management resources.

The focus on risk and cash-flow analysis in the valuation process has heightened appreciation for the overall risk management process for an insurer. Valuation reserves historically have been set independently of the insurer's other risk management resources, which include the margins inherent in pricing, other related liabilities required to be maintained by regulatory authorities such as the MSVR and surplus. In the future, the valuation process must recognize all risk management resources of an insurer and must make an explicit judgment regarding the level of risks to be borne by reserves and surplus.

Perhaps the most significant implication of this finding is with respect to the level of risk appropriately recognized in valuation reserves. Valuation reserves and surplus levels are clearly interrelated in theory, and valuation reserve adequacy must be assessed based on some overall target level of risk management capacity. In a probabilistic sense, valuation reserves should be established so as to be adequate with a fairly high degree of probability, perhaps as high as 90 percent or 95 percent. Surplus should provide assurances that an insurer can fulfill contractual obligations under more adverse circumstances.

This finding also requires that other sources of providing for risk (that is, pricing margins and other reserves) be recognized in establishing valuation reserve levels. Conservative pricing should be rewarded by reduced valuation reserves. Similarly, given the current operation of the MSVR, valuation actuaries should be permitted to recognize this "reserve" in making judgments about provision for asset default risk in valuation reserves.

In the event the MSVR is re-evaluated and modified, then the valuation actuary's recognition of this item may need to be altered accordingly.

Implications of Findings

The above findings have had a profound impact on both valuation theory and practice in recent years. Cash-flow analysis has emerged as the foundation upon which the valuation function must be built. Currently, efforts are underway in the regulatory arena to formally recognize these findings in valuation laws and regulations by requiring the actuary who signs the statutory actuarial opinion to undertake cash-flow analysis where appropriate. Judgments about reserve adequacy based on such analysis will compel valuation actuaries to better understand and provide for the risks assumed at an individual insurer level.

While valuation actuaries and regulators are most directly affected by recent COVARA findings, all levels of management in an insurance company should understand the implications of these findings on their respective responsibilities and objectives. Pricing actuaries, in particular, must become more sensitive to the variability of cash flows associated with their products and reflect such variability in the reserve level assumed in pricing. In the investment area, the investment function must become more focused to produce asset cash flows consistent with those associated with the underlying products. The need for timely cash-flow data has major implications on accounting, administration and systems. Assuring that all areas of an insurance company are operating on a basis responsive to the above findings will test the skills of senior management in effectively leading their companies in the future.

Based on the experience of COVARA members, it is apparent that the above findings present major challenges to all associated with the management and regulation of insurance companies. We firmly believe that responding to these challenges is essential to the long-term viability of the insurance business.

APPENDIX 7

ILLUSTRATIONS OF EXTRA AIDS MORTALITY RESERVE CALCULATIONS FOR NEW BUSINESS AND IN-FORCE BUSINESS

Tables 7-1, 7-2, 7-3, and 7-4 illustrate several reserve calculation methods for a representative whole-life policy issued to a male age 25. Tables 7-1, 7-2, and 7-3 are based on a policy issued in 1989; Table 7-4 is based on a

policy issued 15 years earlier, in 1974. For comparison purposes, the first three tables are based on the Society Committee on HIV Research middle scenario with 80 percent modification factor; the Institute of Actuaries Projection R; and the Canadian Institute of Actuaries projection for U.S. business with 75 percent modification factor, respectively. Table 7-4 is based on the Society Committee middle scenario with 40 percent modification factor. While these factors have been used as flat percentages for these illustrations, the actuary should consider grading the factors upward with policy duration because as time goes on, the normal effect of lapsation will cause there to be a heavier proportion of HIV-infected lives in the in force than is present at issue. In these tables, the effect of margins that may be deemed available to offset some or all of the AIDS cost is not reflected. That is not meant to imply that it would be inappropriate to do so.

The first three tables are based on a selected funding period of the 15 years commencing in 1989. While another period could be chosen, 15 years appears to work well. The fourth table illustrates the use of funding periods of 5, 10, and 15 years, commencing in 1989, since the 15-year calculation gives negative numbers when the flat 40 percent modification is used without the suggested upward grading.

Table 7-1 illustrates the "with and without" method. The excess AIDS mortality reserve is computed, using prospective reserve formulas, as the excess, if any, of a reserve computed on the mortality table whose mortality rates are the regular valuation table augmented by the extra AIDS mortality rates, over the corresponding reserve produced by the regular valuation table without augmentation. This method involves the simplification that valuation premiums falling due after the selected 15-year funding period are not recognized. In other words, the extra mortality reserve is computed as if for this purpose only, the policy were a 15-year payment life policy.

Table 7-2 also funds the extra mortality over a 15-year period but considers regular policy premiums payable thereafter as well. An extra valuation annual premium for the first 15 years (except the first year, under the commissioners reserve valuation method) is defined as:

$$P''_{x+1} = \frac{\bar{A}'_{x+1} - P_{x+1}\,\ddot{\alpha}'_{x+1}}{\ddot{\alpha}'_{x+1:\overline{15}|}}$$

Then, all present values of the defined valuation premiums, as well as of the death benefits, are determined by the mortality table "with AIDS."

TABLE 7-1

COMPARISON OF EXTRA AIDS MORTALITY RESERVE
FOR A WHOLE-LIFE POLICY ISSUED TO A MALE AGE 25 IN 1989
FUNDING PERIOD LIMITED TO 15 YEARS
USING SIMPLIFIED ASSUMPTION
NOT CONSIDERING PREMIUMS PAYABLE
AFTER 15TH POLICY ANNIVERSARY
INTEREST RATE 5.5%, BASIC MORTALITY TABLE 1980 CSO
WITHOUT 10-YEAR SELECT FACTORS
TERMINAL RESERVES PER $1,000 INSURANCE

	AIDS Extra Mortality Table		
Policy Year	SOA Middle Scenario Modified*	Institute of Actuaries†	Canadian Institute Modified*
1	0.00	0.00	0.00
2	0.78	0.48	1.02
3	1.46	0.97	1.83
4	2.02	1.45	2.39
5	2.44	1.88	2.70
6	2.73	2.26	2.79
7	2.89	2.56	2.70
8	2.94	2.77	2.50
9	2.93	2.88	2.26
10	2.89	2.94	2.06
11	2.89	2.94	1.95
12	2.96	2.92	1.98
13	3.12	2.87	2.20
14	3.38	2.88	2.62
15	3.78	2.96	3.26
16	3.24	2.56	2.59
17	2.78	2.17	2.02
18	2.40	1.79	1.57
19	2.07	1.48	1.19
20	1.79	1.21	0.89
Net Extra Annual Premium Years 2–15	1.02	0.51	1.44

*Modification 80% for SOA Table, 75% for CIA (U.S. experience).

†Projection R

$$ {}_tV_{25} \begin{cases} = 0 & t=1 \\ = \bar{A}'_{25+t} - {}_{14}P'_{26}\, \ddot{a}'_{25+t:\overline{15-t}|} & \\ \quad -(\bar{A}_{25+t} - {}_{14}P_{26}\, \ddot{a}_{25+t:\overline{15-t}|}) & t=2-14 \\ = \bar{A}'_{25+t} - \bar{A}_{25+t} & t=15+ \end{cases} $$

where primed functions are based on mortality table with AIDS and unprimed functions are based on mortality table without AIDS.

TABLE 7-2

COMPARISON OF EXTRA AIDS MORTALITY RESERVE
FOR A WHOLE-LIFE POLICY ISSUED TO A MALE AGE 25 IN 1989
FUNDING PERIOD LIMITED TO 15 YEARS
USING MORE REFINED ASSUMPTION
CONSIDERING PREMIUMS PAYABLE
BEFORE AND AFTER 15TH POLICY ANNIVERSARY
INTEREST RATE 5.5%, BASIC MORTALITY TABLE 1980 CSO
WITHOUT 10-YEAR SELECT FACTORS
TERMINAL RESERVES PER $1,000 INSURANCE

	AIDS Extra Mortality Table		
Policy Year	SOA Middle Scenario Modified*	Institute of Actuaries†	Canadian Institute Modified*
1	0.00	0.00	0.00
2	0.85	0.53	1.11
3	1.60	1.06	2.00
4	2.23	1.58	2.64
5	2.72	2.06	3.03
6	3.07	2.49	3.18
7	3.28	2.83	3.14
8	3.38	3.08	2.97
9	3.40	3.24	2.75
10	3.38	3.31	2.55
11	3.38	3.34	2.43
12	3.46	3.32	2.45
13	3.61	3.26	2.64
14	3.86	3.27	3.05
15	4.25	3.33	3.67
16	3.64	2.88	2.91
17	3.13	2.45	2.28
18	2.70	2.02	1.77
19	2.33	1.66	1.34
20	2.00	1.36	1.00
Net Extra Annual Premium Years 2–15	1.09	0.55	1.52

*Modification 80% for SOA Table, 75% for CIA (U.S. Experience).

†Projection R

$$ {}_tV_{25} \begin{cases} = 0 & t=1 \\ = \bar{A}'_{25+t} - P_{26}\,\ddot{a}'_{25+t} - P''\,\ddot{a}'_{25+t:\overline{15-t}|} & t=2-14e \\ = \bar{A}'_{25+t} - P_{26}\,\ddot{a}'_{25+t} & t=15+ \end{cases} $$

where single primed functions are based on mortality table with AIDS, unprimed functions are based on mortality table without AIDS, and P'' is equal to $(\bar{A}'_{26} - P_{26}\,\ddot{a}'_{26})/\ddot{a}'_{26:\overline{14}|}$.

Table 7-3 is a simplified method that resembles in some respects the methods shown in Tables 7-1 and 7-2. Table 7-3 resembles Table 7-1 in that neither recognizes valuation premiums after the fifteenth policy anniversary. However, it resembles Table 7-2 in that the results of Tables 7-2 and 7-3 are substantially (but not precisely) equivalent.

As the formulas in Table 7-3 show, this method uses the mortality table without AIDS to represent a service table. The yearly costs of mortality are computed using the respective products of the extra AIDS mortality rates and the net amounts at risk. The latter are determined using whole life modified preliminary term terminal reserves.

Table 7-4 illustrates how the method of Table 7-2 may be applied to a policy in force. This case uses a policy issued to a male age 25 in 1974 and revalued starting in 1989.

Like the method in Table 7-2, the valuation premium in Table 7-4 reverts to the original valuation premium after the funding period. This method permits a smooth transition from the reserve currently held to the strengthened basis. The method first appeared in *TASA* XLV, in a paper by A.N. Guertin entitled "The Strengthening of Reserves."

TABLE 7-3

COMPARISON OF EXTRA AIDS MORTALITY RESERVE
FOR A WHOLE-LIFE POLICY ISSUED TO A MALE AGE 25 IN 1989
FUNDING PERIOD LIMITED TO 15 YEARS
USING OTHER SIMPLIFIED ASSUMPTION
NOT CONSIDERING PREMIUMS PAYABLE
AFTER 15TH POLICY ANNIVERSARY
INTEREST RATE 5.5%, BASIC MORTALITY TABLE 1980 CSO
WITHOUT 10-YEAR SELECT FACTORS
TERMINAL RESERVES PER $1,000 INSURANCE

	AIDS Extra Mortality Table		
Policy Year	SOA Middle Scenario Modified*	Institute of Actuaries†	Canadian Institute Modified*
1	0.00	0.00	0.00
2	0.85	0.53	1.11
3	1.60	1.06	2.00
4	2.23	1.58	2.64
5	2.72	2.06	3.03
6	3.07	2.49	3.18
7	3.28	2.83	3.13
8	3.38	3.08	2.97
9	3.39	3.23	2.74
10	3.37	3.31	2.54
11	3.38	3.33	2.42
12	3.45	3.31	2.44
13	3.60	3.25	2.63
14	3.85	3.26	3.04
15	4.24	3.32	3.66
16	3.63	2.87	2.90
17	3.12	2.43	2.27
18	2.68	2.01	1.76
19	2.31	1.65	1.33
20	1.99	1.35	1.00
Net Extra Annual Premium Years 2–15	1.09	0.55	1.52

TABLE 7-3—*Continued*

*Modification 80% for SOA Table, 75% for CIA (U.S. Experience).

†Projection R

Let q''_{x+t} = excess AIDS mortality at age $x+t$

$$\overline{C}''_{x+t} = q''_{x+t}\, v^{x+t+1}\, l_{x+t}\,(1 - {}_{t+1}V^{FPT}_{x})\, i/\delta$$

where unprimed symbols are based on mortality table without AIDS. (Note that this function takes into account the underlying whole life reserve on the policy.)

$$\overline{M}''_{x+t} = \sum_{r=0}^{w-x-t} \overline{C}''_{x+t+r}$$

$$\overline{A}''_{x+t} = \frac{\overline{M}''_{x+t}}{D_{x+t}}$$

$${}_{14}P''_{x+1} = \frac{\overline{M}''_{x+1}}{N_{x+1} - N_{x+15}}$$

$${}_{t}V''_{x} \begin{cases} = 0 & t=1 \\ = \overline{A}''_{x+t} - {}_{14}P''_{x+1}\, \ddot{a}_{x+t:\overline{15-t}|} & t=2-14 \\ = \overline{A}''_{x+t} & t=15+ \end{cases}$$

TABLE 7-4

EXTRA AIDS MORTALITY RESERVE
FOR A WHOLE-LIFE POLICY ISSUED TO A MALE AGE 25 IN 1974
FUNDING PERIOD LIMITED TO n YEARS
USING MORE REFINED ASSUMPTION
CONSIDERING PREMIUMS PAYABLE
BEFORE AND AFTER $15+n$TH POLICY ANNIVERSARY
INTEREST RATE 3.5%, BASIC MORTALITY TABLE 1958 CSO
TERMINAL RESERVES PER $1,000 INSURANCE
AIDS EXTRA MORTALITY: SOA MIDDLE SCENARIO
MODIFIED @ 40%

Policy Year after 1989	Funding Period in Years (n)		
	5	10	15
1	0.35	0.12	0.04
2	0.69	0.21	0.06
3	1.03	0.29	0.05
4	1.36	0.36	0.03
5	1.69	0.42	0.00
6	1.52	0.48	−0.03*
7	1.35	0.56	−0.05*
8	1.18	0.64	−0.06*
9	1.03	0.75	−0.06*
10	0.89	0.89	−0.04*
11	0.76	0.76	0.01
12	0.66	0.66	0.08
13	0.56	0.56	0.17
14	0.48	0.48	0.28
15	0.41	0.41	0.41
16	0.35	0.35	0.35
17	0.29	0.29	0.29
18	0.24	0.24	0.24
19	0.20	0.20	0.20
20	0.17	0.17	0.17
Net Extra Annual Premium	0.50	0.28	0.20

$$ {}_tV \begin{cases} = \bar{A}'_{25+t} - P_{26}\,\ddot{a}'_{25+t} - P''\,\ddot{a}'_{25+t:\overline{15+n-t}|} & t = 15 \text{ to } 14+n \\ = \bar{A}'_{25+t} - P_{26}\,\ddot{a}'_{25+t} & t = 15+n \text{ or more} \end{cases} $$

where single primed functions are based on mortality table with AIDS, unprimed functions are based on mortality table without AIDS, and P'' is

$$ \frac{\bar{A}'_{40} - P_{26}\,\ddot{a}'_{40} - {}_{15}V^{FPT}_{25}}{\ddot{a}'_{40:\overline{n}|}} $$

*Use zero.

APPENDIX 8
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