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AIDS FOR HEALTH ACTUARIES

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- o Contract limits
- o Underwriting practices
- o Regulations on underwriting
- o Claim reserving
- o Recent experience
- o Future outlook

MR. WILLIAM F. BLUHM: Let me start by introducing the first speaker. Chuck Fuhrer is with the Health Care Service Corporation which is actually Blue Cross/Blue Shield of Illinois. He has been there since 1985, and before that he was with Benefit Trust. He has worked generally in the area of group insurance, but he has a significant number of papers. He wrote a paper in 1988 on group insurance credibility which is one of the few *Transactions* that I have taken time to read myself, and I found it very good. He won the Actuarial Education Research Fund Practitioner's Award for a paper on aggregate stop-loss and currently participates on five committees in the Society. Chuck is going to talk a bit about the incidence of Acquired Immune Deficiency Syndrome (AIDS) and projections. He will be followed by Susan Comstock, who will be talking about average claim sizes, and then Gregg Sadler, who will be looking at things from an underwriting point of view.

MR. CHARLES S. FUHRER: First, I just wanted to say something, in general, about projections. Just to illustrate how important projections are, it is interesting to compare the AIDS epidemic with automobile accidents and the fatalities that result from them. Both problems are new in the twentieth century; both seem to affect younger and often male victims more; both are estimated to have more than 1 million deaths resulting from them during the twentieth century; and finally, both are considered to be completely preventable. The crucial difference between the two is that most of the deaths from automobile accidents are in the past; whereas most of the deaths from AIDS will occur in the future, or, at least, are projected to occur in the future.

From the very beginning of the AIDS epidemic, projections have really colored what we thought was going to happen. The explosive growth that we have seen since the disease was first identified has caused people to really get excited and afraid of it. If nobody had ever looked into the future, even at the current levels, it probably would not be considered the problem it is. It is certainly not at the levels back in 1983-1984 when the country first became aware of it. I have done some projections to try and determine where the AIDS epidemic is going. I have taken a little different approach than some other people have done. Unfortunately though, my answers have as much variation as everybody else's, maybe more.

A number of mathematical models for the spread of the disease have been presented. In most of these models, the number of people who have the Human Immunodeficiency Virus (HIV) is estimated and then projected. My method of projection is to deal only with the number of AIDS cases each year. By AIDS cases, I mean the full disease as defined by the Centers for Disease Control (CDC). This does not include cases of AIDS-Related Complex (ARC) or asymptomatic viral infections.

The reasons, not necessarily distinct, for taking this approach as follows:

1. Projections are guesses. Even the number of AIDS cases is itself an estimated number because of reporting delays and errors. The number of infections is completely a guess. No

survey or random sample of sufficient size has been performed that gives us any accurate estimate of the number of infections. Projections based on other guesses give little confidence in their accuracy. If one is trying to project AIDS cases, why not base the projections on cases?

2. Most of the models are very sensitive to the mean progression time from the infection to the disease. This progression time has not been estimated very accurately because samples have been small. In addition, the models are also sensitive to changes in the shape of the progression rates over time.

3. Many of the models rely on other collateral data to estimate other quantities. Some of these quantities are: number of "at risk" individuals, number of "at risk" individuals by category (e.g., male homosexuals or intravenous drug users), number of acts per year that might spread the virus, probability of each such act leading to infection, etc. The accuracy of the estimates of these quantities is unknown.

4. The total number of parameters used to project these other quantities may be very large. Often the number of parameters is not obvious or explicitly stated.

Another problem lacking in knowledge is the very set of numbers that I used, the number of AIDS cases. It is rather somewhat of a guess. There is quite a bit of discussion lately about to what extent the CDC, whose counts I used, have actually undercounted the number of AIDS cases. There are a number of sources of those undercounts. Just to mention them briefly, the CDC has a list of diseases that have to occur in order for them to include the case as an AIDS case. In so doing, they sometimes have excluded some cases that were actually reported to them. Although, they did change the definition to expand it to some extent during the latter half of 1987, but obviously there are cases in which the diagnosis of AIDS was never made, either deliberately or perhaps because the person never actually came in contact with the medical community. They may have gotten AIDS and then been hit by a car. Some physicians have deliberately not given the diagnosis because of the social stigma that has sometimes been attached to this disease. The CDC requires certain kinds of confirmation reports and sometimes those just have not been done. On the other side, there is some possibility that there were some double counts or some fictitious cases counted, but those are probably very small. In any case, the CDC says they are only counting 84% of the total cases. It is a more generally held opinion that it is probably as low as only 2/3, which means you would have to add 50% to any number that I would come up with. In any case, I took the CDC data twice, once at the beginning of this year and once at the beginning of last year, and did some projections based on them.

ESTIMATES OF THE NUMBER OF AIDS CASES

My projections are based on the number of new AIDS cases diagnosed each quarter from the first quarter of 1982 through the second quarter of 1988. These numbers were estimated from a January 1989 diskette file obtained from the CDC. Also included herein are projections done a year earlier. A development quarter (runoff) method was used to estimate the eventual number of cases that would be diagnosed each quarter. The results of this are shown in Table 1. The last two quarters of 1988 have not yet had enough reported diagnosed cases to give good estimates. The file did not give the actual month diagnosed for cases diagnosed before 1982.

THE PROJECTIONS

Various curves were fit to the 26 (22 for the 1988 projection) quarters of data and then the fitted curves values were calculated for each quarter from 1982 through 2000. Ten of these are illustrated on Tables 2 through 4 and Graph 1. All of the illustrated fits are done by minimizing the sum of the squares of the deviations. Let the number of estimated AIDS cases in quarter i be equal to Y_i for $1 \le i \le 26$. Let $f(t,p_1 \ldots p_n)$, a function of t and the parameters p_1 through p_n, be the curve to be fitted. Then the set of parameters p_i is found that minimizes the sum of the square deviations:

$$\sum_{j=1}^{22} Y_j - f(i,p_1 \ldots p_n)^2$$

The ten curves used are:

1. Linear: $f(t,p_1,p_2) = p_1 + tp_2$

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TABLE 1

3/14/89

Number of new AIDS cases by calendar quarter in the U.S. "Rept" is the number reported to the CDC as of January, 1988. "Est" is the number estimated that will eventually be reported.

		--Rept 1/89--		---Est 1/89---		--Rept 1/88--		---Est 1/88---	
Year	Qtr.	Cases	Cum.	Cases	Cum.	Cases	Cum.	Cases	Cum.
<1982	Tot	381	381	381	381	352	352	352	352
1982	1	184	565	184	565	175	527	175	527
1982	2	202	767	205	770	190	717	191	718
1982	3	292	1,059	305	1,075	285	1,002	288	1,006
1982	4	375	1,434	401	1,476	364	1,366	373	1,380
1982	Tot	1,053		1,095		1,014		1,028	
1983	1	557	1,991	605	2,081	530	1,896	553	1,932
1983	2	717	2,708	790	2,871	695	2,591	733	2,666
1983	3	766	3,474	852	3,723	750	3,341	801	3,466
1983	4	859	4,333	969	4,693	849	4,190	913	4,379
1983	Tot	2,899		3,217		2,824		2,999	
1984	1	1,154	5,487	1,316	6,009	1,119	5,309	1,211	5,590
1984	2	1,378	6,865	1,589	7,598	1,352	6,661	1,471	7,061
1984	3	1,575	8,440	1,834	9,431	1,527	8,188	1,671	8,732
1984	4	1,738	10,178	2,038	11,470	1,702	9,890	1,869	10,601
1984	Tot	5,845		6,777		5,700		6,222	
1985	1	2,155	12,333	2,546	14,016	2,048	11,938	2,262	12,863
1985	2	2,551	14,884	3,033	17,049	2,399	14,337	2,668	15,531
1985	3	2,975	17,859	3,561	20,609	2,825	17,162	3,167	18,698
1985	4	3,084	20,943	3,715	24,324	2,837	19,999	3,203	21,901
1985	Tot	10,765		12,855		10,109		11,300	
1986	1	3,688	24,631	4,479	28,803	3,330	23,329	3,793	25,693
1986	2	4,122	28,753	5,052	33,855	3,662	26,991	4,219	29,913
1986	3	4,568	33,321	5,663	39,519	3,982	30,973	4,666	34,579
1986	4	4,797	38,118	6,019	45,538	4,112	35,085	4,946	39,525
1986	Tot	17,175		21,214		15,086		17,625	
1987	1	5,572	43,690	7,091	52,629	4,530	39,615	5,658	45,184
1987	2	5,975	49,665	7,736	60,364	4,638	44,253	6,163	51,347
1987	3	6,309	55,974	8,361	68,725	4,338	48,591	6,616	57,963
1987	4	6,252	62,226	8,563	77,288	1,674	50,265	5,496	63,456
1987	Tot	24,108		31,750		15,180		23,934	
1988	1	6,454	68,680	9,266	86,554				
1988	2	6,254	74,934	9,620	96,174				
1988	3	5,597	80,531	9,979	106,153				
1988	4	2,233	82,764	8,936	115,089				
1988	Tot	20,538		37,802					

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TABLE 2

1989 VERSION

2-PARAMETER FITS 3/14/89

Fit:	------Linear--------		-------Exponential------	
Sum of Squares	14,900,390		6,978,360	
Year	Cases	Cum.	Cases	Cum.
<1982	381	381	381	381
1982	(2,890)	(2,509)	3,380	3,761
1983	3,520	1,011	5,223	8,984
1984	9,930	10,941	8,070	17,054
1985	16,340	27,281	12,469	29,523
1986	22,750	50,031	19,266	48,789
1987	29,160	79,191	29,768	78,557
1988	35,570	114,760	45,994	124,550
1989	41,979	156,740	71,065	195,615
1990	48,389	205,129	109,802	305,417
1991	54,799	259,928	169,655	475,072
1992	61,209	321,138	262,133	737,206
1993	67,619	388,757	405,022	1,142,227
1994	74,029	462,786	625,798	1,768,025
1995	80,439	543,225	966,919	2,734,945
1996	86,849	630,073	1,493,985	4,228,930
1997	93,259	723,332	2,308,353	6,537,282
1998	99,669	823,001	3,566,630	10,103,913
1999	106,079	929,079	5,510,793	15,614,705
2000	112,488	1,041,568	8,514,713	24,129,419

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TABLE 2

1988 VERSION

2-PARAMETER FITS 4/19/88

Fit:	-------Linear-------		-------Exponential------	
Sum Squares	3,286,442		1,232,958	
# of Par.	2		2	
Year	Cases	Cum.	Cases	Cum.
<1982	352	352	352	352
1982	0	352	2,320	2,672
1983	3,605	3,957	3,819	6,491
1984	8,138	12,096	6,288	12,779
1985	12,672	24,767	10,351	23,130
1986	17,205	41,973	17,040	40,170
1987	21,739	63,711	28,053	68,223
1988	26,272	89,983	46,182	114,405
1989	30,805	120,788	76,028	190,434
1990	35,339	156,127	125,163	315,597
1991	39,872	195,999	206,051	521,648
1992	44,405	240,405	339,214	860,862
1993	48,939	289,343	558,436	1,419,298
1994	53,472	342,816	919,333	2,338,632
1995	58,006	400,821	1,513,465	3,852,096
1996	62,539	463,360	2,491,562	6,343,658
1997	67,072	530,433	4,101,767	10,445,425
1998	71,606	602,038	6,752,589	17,198,013
1999	76,139	678,177	11,116,540	28,314,553
2000	80,672	758,850	18,300,753	46,615,306

TABLE 3

1989 VERSION

3-PARAMETER FITS 3/14/89

Fit:	-----Logistic-------		--------Quad-Exp--------	
Sum of Squares	367,111		355,400	
Year	Cases	Cum.	Cases	Cum.
<1982	381	381	381	381
1982	1,477	1,858	1,194	1,575
1983	3,197	5,054	3,038	4,612
1984	6,635	11,689	6,718	11,331
1985	12,735	24,425	12,913	24,244
1986	21,603	46,028	21,572	45,816
1987	31,411	77,439	31,320	77,136
1988	39,474	116,913	39,521	116,657
1989	44,623	161,537	43,343	160,000
1990	47,393	208,930	41,314	201,314
1991	48,743	257,673	34,226	235,540
1992	49,370	307,043	24,643	260,184
1993	49,655	356,698	15,421	275,605
1994	49,782	406,480	8,387	283,992
1995	49,839	456,319	3,964	287,957
1996	49,865	506,184	1,629	289,585
1997	49,876	556,060	581	290,167
1998	49,881	605,941	180	290,347
1999	49,883	655,824	49	290,396
2000	49,884	705,708	11	290,407

Fit:	------CB-Lin--------		----------Quad----------	
Sum of Squares	1,157,577		1,029,142	
Year	Cases	Cum.	Cases	Cum.
<1982	381	381	381	381
1982	968	1,349	951	1,332
1983	3,365	4,714	3,171	4,503
1984	7,419	12,134	7,253	11,756
1985	13,231	25,365	13,197	24,953
1986	20,876	46,241	21,004	45,957
1987	30,415	76,656	30,673	76,630
1988	41,899	118,555	42,205	118,834
1989	55,374	173,929	55,599	174,433
1990	70,880	244,809	70,855	245,288
1991	88,453	333,261	87,974	333,262
1992	108,125	441,386	106,955	440,217
1993	129,927	571,314	127,799	568,016
1994	153,887	725,201	150,505	718,521
1995	180,031	905,231	175,074	893,595
1996	208,383	1,113,615	201,505	1,095,100
1997	238,967	1,352,582	229,798	1,324,898
1998	271,804	1,624,386	259,954	1,584,852
1999	306,915	1,931,301	291,973	1,876,825
2000	344,320	2,275,622	325,853	2,202,678

TABLE 3

1988 VERSION

3-PARAMETER FITS 4/19/88

Fit	-----Logistic-------		--------Quad-Exp--------	
Sum Squares		216,915		162,178
# of Par.		3		3
Year	Cases	Cum.	Cases	Cum.
<1982	352	352	352	352
1982	1,446	1,798	1,294	1,646
1983	3,038	4,836	3,006	4,652
1984	6,072	10,909	6,164	10,816
1985	11,123	22,032	11,157	21,973
1986	17,919	39,952	17,829	39,803
1987	24,879	64,830	25,151	64,954
1988	30,273	95,103	31,321	96,275
1989	33,611	128,714	34,434	130,709
1990	35,393	164,108	33,419	164,128
1991	36,269	200,377	28,633	192,761
1992	36,682	237,059	21,657	214,417
1993	36,872	273,931	14,460	228,878
1994	36,959	310,891	8,524	237,401
1995	36,999	347,890	4,435	241,837
1996	37,017	384,907	2,037	243,874
1997	37,025	421,932	826	244,700
1998	37,029	458,961	296	244,996
1999	37,031	495,992	93	245,089
2000	37,032	533,024	26	245,115

Fit	------CB-Lin--------		-------Quadratic--------	
Sum Squares		133,995		129,941
# of Par.		3		3
Year	Cases	Cum.	Cases	Cum.
<1982	352	352	352	352
1982	1,038	1,390	1,088	1,440
1983	3,029	4,419	2,933	4,373
1984	6,349	10,768	6,315	10,688
1985	11,169	21,937	11,232	21,920
1986	17,632	39,569	17,685	39,606
1987	25,865	65,433	25,674	65,280
1988	35,978	101,412	35,199	100,479
1989	48,076	149,488	46,260	146,739
1990	62,252	211,741	58,857	205,596
1991	78,595	290,335	72,989	278,585
1992	97,185	387,520	88,658	367,243
1993	118,102	505,622	105,862	473,106
1994	141,418	647,041	124,603	597,709
1995	167,205	814,245	144,879	742,588
1996	195,528	1,009,774	166,691	909,279
1997	226,453	1,236,227	190,039	1,099,318
1998	260,041	1,496,267	214,923	1,314,241
1999	296,351	1,792,618	241,343	1,555,584
2000	335,441	2,128,059	269,299	1,824,883

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TABLE 4

1989 VERSION

4-PARAMETER FITS 3/14/89

Fit:	Cubic		CB-Quad	
Sum of Squares	756,866		409,289	
Year	Cases	Cum.	Cases	Cum.
<1982	381	381	381	381
1982	1,276	1,657	1,147	1,528
1983	2,750	4,407	3,068	4,596
1984	6,923	11,330	6,862	11,458
1985	13,317	24,647	13,087	24,546
1986	21,454	46,101	21,589	46,134
1987	30,856	76,956	31,122	77,256
1988	41,044	118,000	39,490	116,746
1989	51,540	169,540	44,307	161,053
1990	61,867	231,408	44,050	205,103
1991	71,546	302,953	38,801	243,904
1992	80,098	383,052	30,211	274,115
1993	87,047	470,099	20,693	294,808
1994	91,912	562,011	12,376	307,184
1995	94,217	656,228	6,394	313,578
1996	93,483	749,712	2,812	316,391
1997	89,232	838,944	1,032	317,423
1998	80,986	919,930	308	317,731
1999	68,267	988,197	72	317,803
2000	50,595	1,038,792	12	317,815

TABLE 4

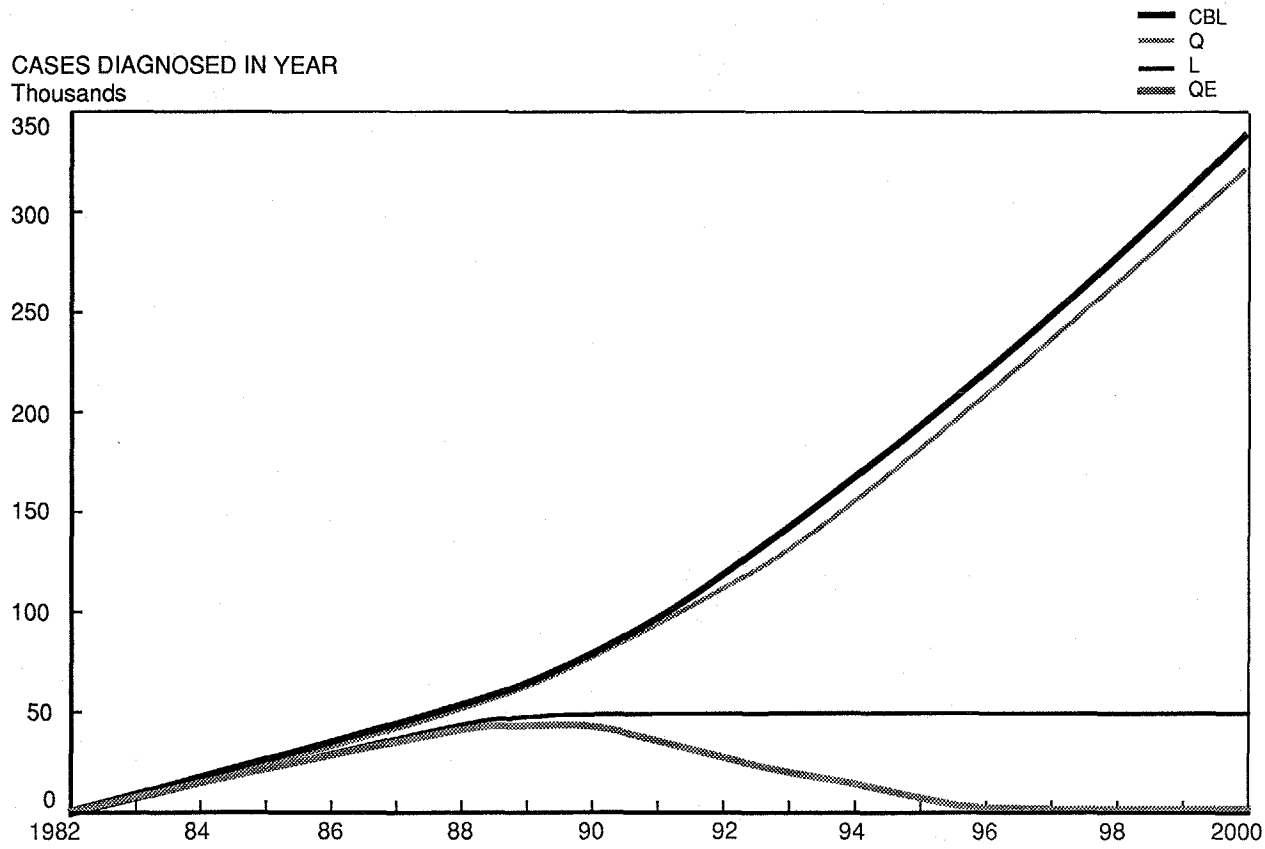
1988 VERSION

4-PARAMETER FITS 4/19/88

Fit	----Logistic-2-----		---------CB-Quad---------	
Sum Squares		158,859		130,552
# of Par.		4		
Year	Cases	Cum.	Cases	Cum.
<1982	352	352	352	352
1982	1,286	1,638	1,070	1,422
1983	2,992	4,630	2,958	4,380
1984	6,164	10,794	6,317	10,697
1985	11,176	21,970	11,195	21,892
1986	17,827	39,798	17,626	39,517
1987	25,189	64,987	25,633	65,150
1988	31,972	96,959	35,237	100,388
1989	37,068	134,027	46,453	146,841
1990	39,814	173,842	59,294	206,135
1991	39,938	213,780	73,772	279,908
1992	37,429	251,208	89,897	369,804
1993	32,530	283,738	107,676	477,481
1994	25,863	309,601	127,118	604,599
1995	18,500	328,101	148,229	752,828
1996	11,734	339,835	171,016	923,844
1997	6,550	346,385	195,484	1,119,328
1998	3,217	349,602	221,636	1,340,964
1999	1,397	350,999	249,479	1,590,443
2000	540	351,539	279,016	1,869,459

Fit	------Cubic---------		-------Cubic-Exp--------	
Sum Squares		129,377		125,245
# of Par.		4		
Year	Cases	Cum.	Cases	Cum.
<1982	352	352	352	352
1982	1,070	1,422	1,077	1,429
1983	2,957	4,379	2,942	4,371
1984	6,327	10,706	6,310	10,681
1985	11,219	21,925	11,248	21,929
1986	17,670	39,595	17,657	39,586
1987	25,719	65,314	25,874	65,460
1988	35,402	100,716	37,556	103,015
1989	46,758	147,474	57,335	160,350
1990	59,825	207,299	97,845	258,195
1991	74,640	281,938	198,536	456,731
1992	91,240	373,179	509,857	966,588
1993	109,665	482,844	1,765,214	2,731,802
1994	129,951	612,794	8,780,880	1.1513E+07
1995	152,136	764,930	66,900,727	7.8413E+07
1996	176,258	941,188	8.3215E+08	9.1057E+08
1997	202,355	1,143,543	1.8005E+10	1.8916E+10
1998	230,464	1,374,007	7.2147E+11	7.4038E+11
1999	260,624	1,634,632	5.6948E+13	5.7688E+13
2000	292,872	1,927,504	9.4095E+15	9.4672E+15

U.S. AIDS CASES PROJECTIONS 1989
3-parameter curves



2. Exponential: $f(t,p_1,p_2) = e^{(p_1+tp_2)}$
3. Logistic: $f(t,p_1,p_2,p_3) = p_1/[1 + e^{(p_2+tp_3)}]$
4. Quad-Exp: $f(t,p_1,p_2,p_3) = e^{(p_1+tp_2+t^2p_3)}$
5. CB-Lin: $f(t,p_1,p_2,p_3) = [(p_2+tp_3)p_1+1]^{1/p_1}$
6. Quadratic: $f(t,p_1,p_2,p_3) = p_1+tp_2+t^2p_3$
7. Logistic-2: $f(t,p_1,p_2,p_3,p_4) = p_1/[1 + e^{(p_2+tp_3+t^2p_4)}]$
8. CB-Quad: $f(t,p_1,p_2,p_3,p_4) = [(p_2+tp_3+t^2p_4)+1]^{1/p_1}$
9. Cubic: $f(t,p_1,p_2,p_3,p_4) = p_1+tp_2+t^2p_3+t^3p_4$
10. Cubic-Exp: $f(t,p_1,p_2,p_3,p_4) = e^{(p_1+tp_2+t^2p_3+t^3p_4)}$

Some Comments on the Fits
The 2-parameter curves did not fit very well. The sum of the squares are, in both cases, very high. All four of the 3-parameter curves fit about equally well in 1988, but the logistic and quadratic exponential were superior in the 1989 projection. The decrease in the sum of squares in going to 4 parameters was small, and therefore the 3-parameter curves are preferred.

The CB-Lin curve is called this because it is based on a Cox-Box transformation of the variable, fit to a linear formula. It is between the linear curve and the exponential curve in that if $P_1=1$ it is linear and as p_1 goes to 0 it approaches the exponential. The same is analogously true for the CB-Quad and its relation to the quadratic and Quad-Exp, respectively.

The Logistic curve at first has a high slope and then levels off. This is an appropriate shape for the incidence level of a new disease, showing a rapid increase until approaching an eventual equilibrium.

MR. BLUHM: The next speaker is Susan Comstock, an FSA and a Fellow of the Casualty Actuarial Society (FCAS). She is a Consulting Actuary in Milliman & Robertson's (M&R) Milwaukee Office. She has been with M&R 2 1/2 years and has worked for both life and health companies, property and casualty companies, and in a couple of consulting firms. She has been involved in working on the AIDS projects from both the casualty and the health point of view.

MS. SUSAN COMSTOCK: I want to cover the medical costs of AIDS. We have had some input on incidence, so I thought I would just focus on the question of how much is AIDS costing per case.

I will start off with a recap of a few recent surveys, both employer surveys and insurance company surveys. I have a number of comments in terms of the medical cost studies that have been done and what I refer to as the analyses of the medical cost studies that have been done, which we could maybe call a higher level of medical cost study. I have a few tables where I have extracted some information from Michael Zurcher's model that is in the SOA Task Force on AIDS report. Lastly, I have some comments on case management programs and how they can impact the medical costs of AIDS.

The following is a list of recent surveys:

- o 1987 Employer Survey by Alexander & Alexander
- o January 1, 1985-June 30, 1987 Insurer Survey by North American Reassurance
- o 1988 Case Studies of Health Maintenance Organizations (HMOs), Insurers, and Employers by Warren Greenberg
- o 1987 Claim Survey by the Health Insurance Association of America (HIAA)/American Council of Life Insurance (ACLI)

The first one I have a couple of comments on is on the employer side. Alexander & Alexander recently did a survey of employers. It is the largest response that has been received so far with more than 2,000 employers responding. They were soliciting from all size groups. In terms of the

medical costs of an AIDS case, their survey results came up with an average around $48,000. The range was $2,000 to $150,000. Just a comment here about that range. That is pretty typical. Whenever we come up with the mean cost, whether it is a survey or a study, it seems like the standard deviation pretty much always equals the mean, which means we are still a lot in the dark and there are a lot of variations. By geographical region, their survey came up with the Central U.S. as having the highest cost rather than the Northeast. The Northeast followed in the number two slot. As most people would expect, the West came in as the lowest cost area. In terms of industry, the highest incidence category was the transportation/communication/utility grouping. The second category was the finance/insurance/real estate grouping. Most large employers, defined as 10,000 or more, have experienced an AIDS case that they were aware of.

The second survey that I want to comment on is the North American Reinsurance survey of life and health companies and Blue Cross/Blue Shield. They had a sample of about 12,000 claims; nearly 10,000 of those claims were medical claims. The average claim cost in their survey was around $24,000. They also reported that the increase in claims cost from 1985 to 1986 was 55%. Going from 1986-1987, the total dollar cost was increasing 50%. They asked the insurers if they were using medical case management on their AIDS cases and 59% responded in the affirmative.

The third study is one by Warren Greenberg. He is an Associate Professor in Health Services Administration and Health Care Services at George Washington University. He performed what he calls a telephone mini-case survey study. He focused on five states: California, New York, New Jersey, Texas, and Florida. Then, he focused on providers and employers, so he included in his survey, for the five states, five Blue Cross/Blue Shields, five insurance companies, five HMOs, and five employers. He covered a lot of topics in his survey and I am just going to focus on the medical costs responses that he received. In total, he concluded that impact on the industry was not nearly as severe as originally anticipated, and that the impact on pricing has been negligible to 1 or 2%. The kinds of lifetime costs he got back in the survey ranged from $35,000 to $60,000. Most of the detailed numeric responses came from the Blue Cross/Blue Shields. Their range was typically $50,000-60,000. The life insurance companies that responded, quantitatively again, had the same sort of range. His HMO response came from Kaiser, and there are probably quite a few of you here familiar with the Office of Technological Assessment (OTA) study that was done with Kaiser. They have put out a lot of statistics on what the costs have been with respect to treating their AIDS patients and their overall average is $35,000. This is in the California Bay area region. Warren Greenberg also asked these people how many enrollees they had and calculated a per-year cost and came up with $11. So, for those who think in an annual cost, that answers the question in terms of an overall way. For those of us who may think in a monthly cost, that is less than $1 a month for your subscribers or enrollees.

The last survey that I would like to comment on is the HIAA/ACLI survey. There was a 1986 claims survey, a midyear 1987, and the full-year 1987 report just came out a couple of months ago, and I made up charts of a couple of the exhibits from those studies. In 1986, 275 companies responded to the survey, and they represent, nationwide, 46% of all life and health claims paid by the insurance industry. The following chart shows how many millions of dollars the respondents to the survey reported for their AIDS claims and how many in total. As you can see, in 1986 only the life claims are even approaching 1%. So, if we are looking at this in the short term it is not too significant.

Moving forward to 1987, the percents are going up. The most significant increase, as well as the highest rates, again are in life insurance. Of course, our most serious concern as to what the long-range costs will be is for those products that are not annually renewable term products. I also think it is interesting that group accident and health, which is where the bulk of the premium dollars are for accident and health, increased dramatically; but I am kind of skeptical that the 1986 number was unusually low due to underreporting.

When looking at these industry percentage numbers, which I think help us to feel a little more calm about the whole issue, we have to temper that with the underreporting. We are aware that there is underreporting and that there are time lags in reporting of AIDS cases in the CDC data-base. I think that the underreporting issue is far more serious in a claims study of the insurance industry. When there is no difference in benefits, whether the cause of illness or the cause of death is AIDS or something else, we have extra handicaps in trying to determine what claims costs are associated with AIDS. One of the key items that people key off of is the death certificate. To

give an example of the handicap encountered there, in New York the only cause of death required on a death certificate is the phrase "natural cause" or "external cause."

HIAA/ACLI SURVEY
AIDS-Related Claims as Percentage
of Total Claims Paid (in Millions) in 1986
Reporting Companies

Line of Business	AIDS Claims	Total Claims	Ratio
Ordinary Life	$ 64.4	$ 6,796	0.9%
Group Life	44.7	5,004	0.9
Individual A&H	10.4	1,466	0.7
Group A&H	30.9	9,227	0.3
Total	$150.4	$22,493	

HIAA/ACLI SURVEY
AIDS-Related Claims as Percentage
of Total Claims Paid (in Millions) in 1987
Reporting Companies

Line of Business	AIDS Claims	Total Claims	Ratio
Ordinary Life	$ 89.2	$ 7,175	1.2%
Group Life	77.4	5,442	1.4
Individual A&H	17.5	2,646	0.7
Group A&H	109.8	17,322	0.6
Total	$293.9	$32,585	

The medical costs may have been incurred before an official AIDS diagnosis was reached and therefore it would not be on the claim form. Then, of course, there are physicians who are intentionally not reporting anything that would reveal that this individual indeed is suffering from AIDS. Then there may be the instance where there was no intention to withhold the information, but just through shortcuts, time pressures, whatever, maybe the form says cancer instead of AIDS or the person doing the coding at the insurance company was rushing through and not reading everything written on the claims form. So, I think we have to take into account when we review the industry surveys that there could be very significant underreporting of AIDS claims where in the payment of that claim it is irrelevant whether the person has AIDS.

The following is a list of some of the various medical cost studies:

- Jane E. Sisk -- Summer 1987 -- Health Affairs, "The Cost of AIDS: Review of the Estimates"
- Linda T. Bilheimer -- October 1987 -- Mathematics Policy Research, Inc., "Problems in Obtaining Statistics on AIDS"
- Daniel M. Fox and Emily H. Thomas -- Winter 1987/1988 -- Law, Medicine & Health Care, "AIDS Cost Analysis and Social Policy"
- Anne A. Scitovsky -- Fall 1988 -- Health Affairs, "The Economic Impact of AIDS in the United States"
- Fred J. Hellinger -- Winter 1988 -- Inquiry, "National Forecasts of the Medical Care Costs of AIDS: 1988-1992"

I think I have looked at about thirty or forty of them. I selected the five to list here as sort of a bibliography because these focus on comparing and contrasting other cost studies that have come before, and there is quite a wide variety in the different kinds of studies that people have used. When you just get the news media synopsis that says that "so-and-so's" latest study says the average lifetime cost of AIDS is $50,000, you are not really sure how to interpret that for use in pricing of your health product if you do not know something about the study itself. These five probably do the best job of commenting on the kinds of features that help you interpret the studies if you are not going to go back and dig into every study yourself. Also, in their bibliographies, they have the references to probably every significant study that has been done today on the medical cost of

AIDS. Rather than talk about "so-and-so's" study and "so-and-so's" findings, I am going to just make some overview type comments.

First, we started off very concerned about the medical cost of AIDS. There was a lot of focus initially on the costs being in excess of $100,000. Hardy came out with a study on the first 100 AIDS cases at $147,000. A number of insurance companies initially were reporting some individual cases with very high costs. We did not know or understand much about the disease or what treatment patterns the medical community would be using; and there was a lot of media attention at the time those high estimates came out. Now we have been hearing, for the last year or so, a lot of lower numbers. People have also been focusing on comparing AIDS with other diseases and the cost of AIDS per patient is not the highest-cost disease we have around to treat. It is similar to end-stage renal disease in terms of per patient lifetime cost. If we look at it in terms of the total U.S. health care budget and how those billions are divided up, it is approaching the level of auto accidents, but even in the projections out in the next few years, it is not going to close in yet on cardiovascular disease in terms of overall costs in the U.S. So, although we are seeing a lot of things that cause us to not panic about the medical costs of AIDS, I think it is important that we not be lulled into thinking it is a non-issue at this point, because we do not know where the incidence is going. So even if the cost per patient is not out of line with the other costly diseases in this country, the incidence rate is a major unknown. It is also one of the few costly diseases that affects the young people. As Chuck said, basically it is the auto accidents and AIDS that are driving up the costs for the young people and many of the other diseases are not taking a heavy financial toll from the health care system until the later ages.

The following are thoughts to keep in mind when looking at some cost studies and trying to translate those data into a useful form in pricing health products, and some questions to ask when dealing with it.

ISSUES IN USING COST STUDY DATA

The Source:
- Hospital, Insurance Company, HMO, Medicaid?
- Cost versus Charges? Total or Excluding Out-of-Pocket and Coordination of Benefits?
- Years of Data?
- Sample Size?
- Incidence-based or Prevalence-based?
- Results per Month, per Year, or Lifetime?

Included Costs (or Charges):
- AIDS Only? How Defined? How Identified?
- Medical Categories: Inpatient, Outpatient, Physician, Drugs, Home Care, Counseling?
- Azidothymidine (AZT)?
- Estimated Value of Volunteer Services?

Key Variables:
- Geographical Location
- Presenting Condition Mix -- *Pneumocystis carinii* Pneumonia (PCP), Kaposi's Sarcoma (KS), Other
- Risk Group Mix
- Extent of Cases which are Pediatric, Dementia, or Homeless
- Case Management Practices

What was the source of the study? A hospital, insurance company, an HMO, Medicaid. You particularly have to watch whether or not it is a cost study versus a charge study. The Medicaid reports typically will focus on what were the charges paid by Medicaid and then make an assumption as to how to translate that back to what the actual hospital cost was. When you are focusing on insurance company data, you usually are getting what was the cost to that company, which means you are not picking up the patient's out-of-pocket costs or the coordination of benefits costs paid by another carrier. HMOs often have the ability to purchase their medical services at a lower rate than insurance companies and presumably use case management to a larger extent than an insurance carrier. So, there are a lot of items to keep in mind as to who did the study and how they count their dollars. Also, an important question is the years of the data collection. Particularly it is not just the standard questions of trend, are these 1983 dollars or are these 1986 dollars, but also particularly if we are focusing back to 1983 dollars, a lot of days were

spent in an intensive care unit that in 1990 will not be spent in intensive care because the physicians understand more about how to treat the disease. Initially when this new and unknown disease showed up, there was more of a tendency to put the patient in intensive care because physicians were not sure what was going to happen in the next hour or the next day.

Another important question to ask is: Did the study track 5 cases, 50 cases, or 500 cases? Was the study incidence based or prevalence based? The incidence-based study would be tracking the group of people all having the same year of diagnosis, whereas the prevalence-based study is a snapshot of everybody at one point in time. One last question: Are the results per month, per year, or lifetime? This can be kind of a sneaky question. A lot of reports will focus on the lifetime cost of treating an AIDS patient, but the study data did not come that way. The study data came from a one-month snapshot of what was happening at the hospital with hospital costs during that month. Then they multiplied the one-month cost times the assumed life expectancy at the time that study was being published. So, there are things there that you need to take into account when you are looking at a study, that by the time it is published, maybe we can consider some of the things like the lifetime expectancy projection to already be out of date.

Continuing on with some more thoughts about interpreting study data, an important question is: Does the study focus on AIDS only, and how is it defined and identified? Most of the studies do focus on AIDS only, very few take into account the cost of ARC or people who are just HIV positive. Kaiser's study did look at ARC, and they found in their study that the monthly cost per ARC patient was approximately 27% of the monthly cost of an AIDS patient. There is also a lot of variation in the studies as to whether or not they use the CDC definition, and again the under-reporting issue. If the study is keying on the CDC definition, then we have to tie back to the study year again to find out if that definition included dementia and wasting syndrome or whether the study preceded that expansion of the CDC definition. As far as the medical cost categories covered, most of the studies do focus heavily on the inpatient hospital cost. Again, when reading the synopsis, if it says average cost of $25,000, we have to read a little closer to see if that is per year, per lifetime, and whether that is inpatient hospital only or also included outpatient facility charges, physician charges, drugs, home care, and psychological counseling. Few of the studies have covered AZT. Those that have, have primarily done it on a theoretical basis rather than a capturing of history. That is, of course, because our history period with AZT has not gone too far back.

I will digress for a moment on the cost of AZT. A lot of the published studies still are talking about the cost being $10,000-20,000, $10,000 for the drug and up to another $10,000 per year to treat the side effects. One of the studies in particular, Hellinger's report, puts the cost at $5,000 per lifetime. His information came basically through phone surveys with pharmaceutical people. He found that about half of the AIDS patients are receiving AZT and that their dosage has decreased significantly in the current time period, and also, the wholesale price has been coming down recently. So, he came up with about $5,000 as the cost of the drug per year per patient (about half of the AIDS patients taking the drug and a two-year lifetime coming back to a $5,000 per patient per lifetime average). Now, in terms of this gap ranging from $5,000-20,000, my opinion is leaning towards the lower side. I did work on a project with rider pricing for a client and did the same type of thing, seeing how much information we could get directly from the pharmaceutical people, where there is some reluctance to share some information because of confidentiality. I did reach the opinion that the costs are, or should be, lower than that initial $10,000 estimate, particularly if you are dealing with a situation where you have bargaining power with the pharmaceutical company so that you do not have to pay full retail price.

One more item on this list is that a large number of the studies do focus on San Francisco, and it is important to take into account the estimated value of the volunteer services being provided in the San Francisco area. You may be doing pricing for an area where you are not confident the community is going to develop that kind of volunteer network to provide some of the home health care, homemaker care type services that help keep the inpatient costs down.

Geographical location is, of course, a variable not only because medical services vary in price from area to area, but because of where the disease is located and where the AIDS cases of the coming years will be located. We know that the proportion of the cases that are in San Francisco and New York as a proportion of the whole nation are lowering, so there is more of a concern now for the other geographical areas as to where the costs for the coming years will be.

The presenting condition mix matters. PCP is a lot more expensive to treat than KS and other infections, and so as that mix changes, that affects how we project the future. The risk group mix also affects what is happening. The percent of homosexual cases is on the decline. The intravenous drug user is on the increase. Also, in looking at the studies, some of the studies may not include pediatric patients. They are becoming a larger and larger issue, because their count is growing. A lot of the studies, as I mentioned before, will not include dementia and wasting syndrome if they were using the old CDC definition as the key for their study. Some of the studies coming out of New York need some interpretation because they have more inpatient days, not because the treatment was necessary, but because the patient had no home to go to. Then, the case studies results also need to be interpreted in light of how much case management was a part of that program and how much it will be a part of the program that you are pricing for. I think we can see that most clearly in the studies coming out of the California HMOs. Their costs are quite low in comparison to the more nationwide numbers we see. Part of that probably comes from the efficiency of the system in San Francisco, and part of that probably comes from the HMO case management techniques.

After looking over all of these various studies, I did try to reach my own conclusion on what I thought the overall medical costs of treating an AIDS patient was. I must say I concluded that I do not think we have very firm conclusions. The usual range everyone quotes is $60,000 to $80,000. I am pretty comfortable with that range. I find it very interesting, though, that some of the people who have reached that conclusion in their published papers have reached the same number for different reasons and different types of uses of it. In some cases, they are talking about the total cost from the day you are diagnosed as having AIDS until death. In others, they are talking about costs from the day you are HIV+ until death. The one thing that the studies do seem to agree on is that we are seeing a lot of shift of costs from inpatient to outpatient. In the early studies, inpatient costs were assumed to be 90% of total cost. Now, depending again a lot on the study, it is bearing 70% to considerably less.

Now, in terms of having some specific numbers to share with you, I have decided to use those out of the SOA Task Force report.

MICHAEL ZURCHER'S MODEL

Lifetime Medical Costs
(Before Deductible and Coinsurance)

$50,800	Excluding Life-Extending Drugs
21,500	Life-Extending Drug
$72,300	Total Medical Cost

This is out of Michael Zurcher's model and his total lifetime medical cost falls right in the $60,000 to $80,000 range. In his model, he has about half of the people using life extending drugs and about half not using them. Breaking that down into the stages of the disease, for AIDS only, he is at about $56,000.

MICHAEL ZURCHER'S MODEL

By Stage

HIV+	$ 650
Lymphadenopathy Syndrome (LAS)	2,950
ARC	12,850
AIDS	55,900
Total	$72,350

So, if we are comparing some other studies that quoted the $60,000 to $80,000 range from date of diagnosis of AIDS on, he is still within that range also. Backing up with just a comment on providers, the inpatient cost is primarily coming in the AIDS stage. Most of the cost in the earlier stages is for counseling, physician visits, and drugs. In particular, life extending drugs are having a significant impact at the ARC stage.

The next chart breaks down the grand total cost by benefit and category:

MICHAEL ZURCHER'S MODEL
By Benefit

Inpatient	$ 33,100
Outpatient	11,900
Drugs	4,000
Psychiatric	1,800
LED	21,500
Total	$ 72,300

As you can see here, in his model with the life-extending drugs (LED) being estimated at the $20,000 level, the inpatient costs, as projected for the future, have become a much smaller part of the whole than it was in 1983.

COST CONTAINMENT

Case management programs have several objectives: cost containment, quality of care, and quality of life. From the various reports that I have read, it seems as though emphasizing quality of life works just as well in containing cost as emphasizing containing cost. That has a lot to do with the case manager coming in and assessing the support system, the family, the friends, the community, financial considerations, personal preferences (such as, "I really do not want to die in the hospital and I particularly do not want to die in intensive care"). Sometimes addressing those quality-of-life issues leads to a lot of cost containment through making arrangements for the person to be cared for by family and friends rather than in the hospital. I found that rather interesting, in that I think this is one place where that seems to work very well. Some of the keys to making a case management program work are early identification, who the case manager is, and the willingness of the insurance carrier to allow for provisions that are not in the contract. The identification should start, at the latest, when the person is going through preadmission review to go into the hospital. If possible, it is nice to identify the cases through the provider, primarily the physician, even earlier. A lot of the programs use case managers who are in the local community, who know the local community's resources, and who work with the individual and the family in terms of arrangements for home care. Although some do find that using the expert via the 800 phone line works well, too.

Some of the things that typically are not covered in a contract are home care where that home care is homemaker service and someone to go to the grocery store; transportation to go to and from the outpatient clinic where the patient can receive drug therapy; and certain drugs that are not covered under the contract, but may prove less costly than an inpatient stay. These can become important parts of making the program work for both the patient and for minimizing the cost.

A couple of comments on treatment options. Outpatient clinics, when treatment is available there, are no problem with our contracts. Home health care, skilled nursing care, and hospice can sometimes require some extra work in order to use those facilities which can cost less per day than having the patient stay in the hospital. The home health care is an issue, again, of contractual provision. Some nursing homes are full and it makes it easy for them to then avoid accepting AIDS patients. Some hospices have requirements as to the patient's expected lifetime and the patient's agreement to not take any kind of life-extending drugs. That could make the hospice, then, an unacceptable alternative because of certain regulations. So, in using case management to maximize the return for both the patient and the party paying the bill, some flexibility is required.

In summing up, I would just like to say that, even though the recent studies all lead us to believe that the cost of treating an AIDS patient is not as severe as that $150,000 average estimate we were working from years ago, I think it is important that we keep abreast of what is going on and work to manage the cost, because the incidence rate is the big unknown that may continue to make AIDS an important health care cost issue.

MR. BLUHM: Our third speaker is Gregg Sadler. Those of you who attended the session that was like this in Anaheim last year will recognize him. I asked him if he would like to come back and do a reprise on his talk then, and he agreed to do so. You will also remember that he is a very good speaker. He has updated his information with some even better and more terrific things. At

that time, Gregg was the Senior Vice President of Underwriting at Business Men's Assurance Company, and since then has become the Executive Vice President of Administration at Home Office Reference Laboratory (HORL). He is also involved with some other committees, including the ACLI Risk Classification Committee and he is on the Executive Council of the Home Office Life Underwriters Association.

MR. GREGG R. SADLER:

INSURANCE TESTING FOR HIV ANTIBODIES

According to the CDC, as of March 11, 1989, 88,000 confirmed cases of AIDS have been reported in the U.S. with 1,000,000-1,500,000 people infected with HIV.

I have several concerns about the effect the AIDS epidemic will have on the insurance industry:

First, HIV infection is continuing to spread. According to *Barrows* on March 13, 1989, an unpublished CDC study of more than 20,000 college students at 20 universities throughout the U.S. shows 1 of every 300 students to be infected with HIV. I will show some disturbing statistics later on in my presentation about the rate of HIV infection in medium- to low-risk states.

Second, I am fearful that the level of underreporting of AIDS cases may be even more substantial than earlier estimated. The level of underreporting is difficult to accurately research, but I understand that there are some studies about to be released that may shed more light on this.

Third, most of the focus of the CDC, insurance company statistics, and other published studies seems to be on the number of AIDS cases reported and not on the prevalence of HIV infection. The incidence of HIV infection is a critical factor needing more study.

Lastly, the availability of life and health insurance for considerable amounts of coverage ($100,000 or more of life insurance) without required HIV antibody testing may be resulting in considerable antiselection.

Using the CDC estimate of 1.5 million infections in the population, the prevalence rate of HIV+ would be about 600 per 100,000. During 1988, HORL detected HIV antibodies at a rate of 86 positive results per 100,000 specimens tested. There are several reasons why the HORL HIV antibody positive rate is less than the population prevalence: 1) many infected individuals (or those who believe themselves to be at high risk of infection) are unwilling to submit to testing; 2) significant amounts of coverage are available without testing; 3) legal prohibitions against HIV antibody testing in California and Washington, D.C.; 4) most intravenous drug users and prostitutes are not large buyers of insurance; and 5) the average age of insurance applicants tested may be higher than the average age in the general population. According to the study released February 10, 1989, by the ACLI and the HIAA, AIDS insurance claims have increased dramatically. There was a 67.7% overall increase in AIDS claims from 1986-1987. Ordinary Life increased 40.2%, Group Life 66.9%, Individual Accident and Health 3.5%, and Group Accident and Health 121.7%.

In 1987, estimated AIDS claims were $487,200,000 or 0.9% of total claims. Ordinary Life AIDS claims were $130,800,000 or 1.2% of total claims, Group Life $132,500,000 or 1.4%, Individual Accident and Health $35.900,000 or 0.7%, and Group Accident and Health $188,000,000 or 0.6%.

The survey also showed considerable variance among companies in the percentage of AIDS claims to total claims. Companies having less than 0.5% of total claims for AIDS accounted for 17.6%, while 41.1% had between 0.5-1%, 27% had from 1-2%, 11.9% had from 2-3%, and 2.4% had 4% and over. This may be due to variances in underreporting, geographic mix of business, product mix, recent growth, underwriting practices, mix of business by age, and the amount of antiselection experienced.

HIV ANTIBODY TESTING

Testing accuracy is essential in HIV antibody testing. The current tests most often used are the HIV antibody ELISA (enzyme-linked immunoabsorbent assay), confirmed by the Western Blot.

A positive result means that the applicant's specimen was reactive on two of three separate ELISAs and met the criteria for positive on Western Blot confirmation. Using Bayesian mathematics, the predictive value of a laboratory test can be shown by the following formulas:

$$\text{Predictive Value} = \frac{P \times Se}{(PXSe) + (1-P) \times (1-Sp)}$$

P = Prevalence; Se = Sensitivity; Sp = Specificity

The predictive value of ELISA only in a 10% prevalence population (Sensitivity = 100%, Specificity = 99.8%) would be 98.2%. However, the prevalence of the same test in a 1% population drops to 83.5%, illustrating the need for Western Blot confirmation. The predictive value of ELISA and Western Blot confirmation is 99.99%+.

In 1988, HORL confirmed HIV antibody positives (per 100,000 applicants) were as follows:

Ages	HIV Antibody Positive (Per 100,000 Applicants)
20-29	126
30-39	99
40-49	71
50-59	42

One of the surprising things is that there is not as much difference by age as there used to be. That is of concern to me. I believe a lot of the people who are tested for insurance and are positive now did not know they were positive. It is concerning that we have this high of a positive rate in a population of people who do not know they are positive. The younger ages have always been the highest, but the slope by age is getting flatter and flatter. I am afraid that it is a predictor of costs to come at the higher ages.

There is some variation by geographic area. Listed below are the top 6 prevalence areas per 1,000 applicants tested:

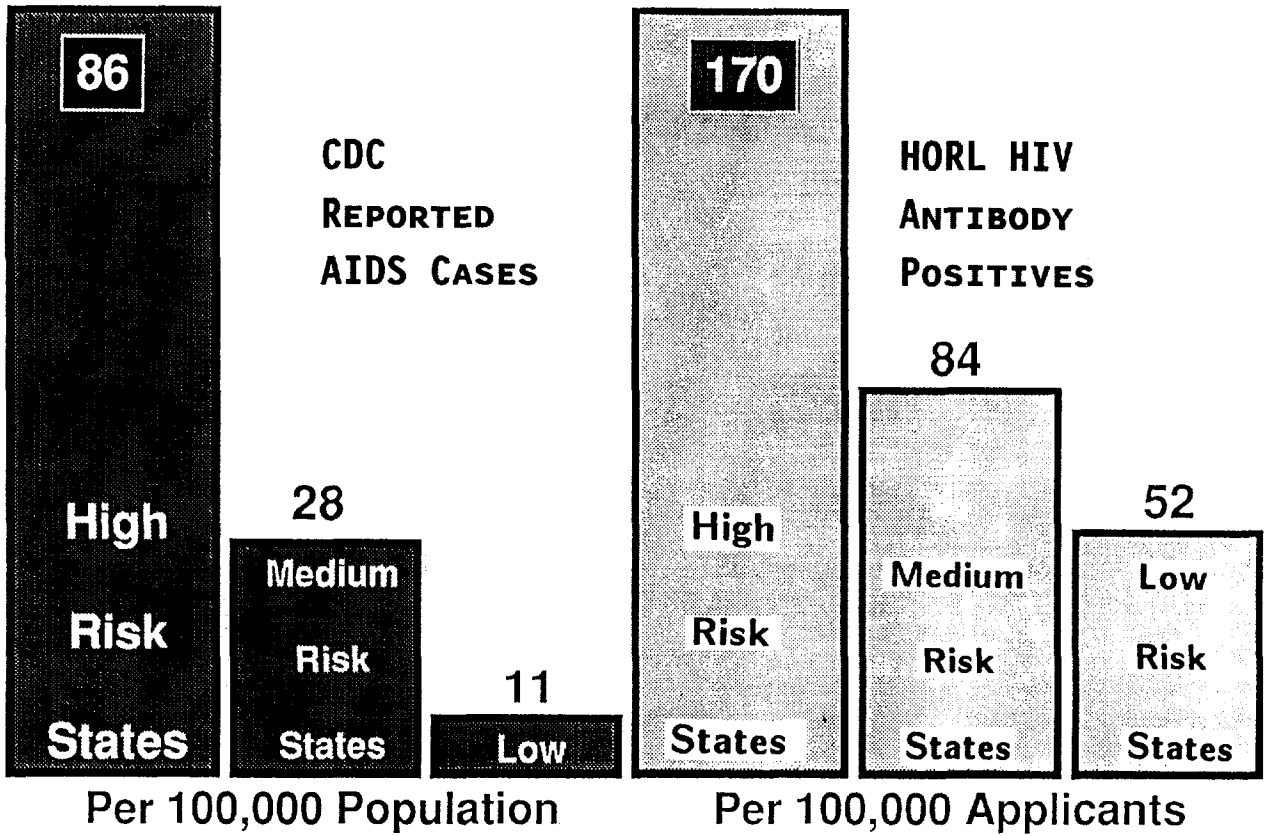
Area	HIV Antibody Positive (Per 1,000 Applicants)
Puerto Rico	2.1
Florida	1.8
New York	1.8
Georgia	1.6
New Jersey	1.3
Nevada	1.2

As shown in Graph 2, there is much less variation in HORL HIV antibody prevalence by geographic area than in the AIDS cases reported by the CDC. This has important implications to insurance underwriting for HIV infection.

WESTERN BLOT INDETERMINATIONS

Some situations arise when a specimen is found to be reactive in two or three antibody ELISAs, but the results of Western Blot analysis do not meet the criteria for a positive Western Blot. In these cases, the concern is that the proposed insured may be in the early stages of seroconversion, and although infected with HIV, may not yet have developed adequate antibody to register as a positive on the Western Blot. This finding is termed an indeterminate Western Blot. Indeterminate Western Blot results were formerly a problem in the underwriting areas. However, in early 1988, investigators at Walter Reed Army Institute of Research (WRAIR) developed an algorithm which made it possible to resolve the vast majority of indetermination results. By utilizing an assay employing recombinant DNA derived protein products specific for the gp-120/gp-41 region of HIV in conjunction with the Western Blot, approximately 98% of the indeterminations can be immediately resolved. The remaining specimens can be resolved by performing a Radioimmunoprecipitation Assay (RIPA). Of 4 million specimens studied at WRAIR, only three remained indeterminate for HIV exposure. These three were then resolved with a second specimen.

To investigate the applicability of the WRAIR algorithm to the insurance industry population, HORL performed a parallel study. Eighty HIV seropositive, 120 HIV seronegative, and 200 HIV indeterminate specimens were selected at random for analysis using the recombinant assay.


86
High
Risk
States
28
Medium
Risk
States
11
Low
CDC
REPORTED
AIDS CASES
Per 100,000 Population
170
High
Risk
States
84
Medium
Risk
States
52
Low
Risk
States
HORL HIV
ANTIBODY
POSITIVES
Per 100,000 Applicants

The test results showed all 80 seropositive specimens to again be reactive by the recombinant assay. The 120 seronegative specimens were all found to be nonreactive. Of the 200 indeterminations, 8 were found to be reactive, while 192 were nonreactive. The test protocol, resolves that all indeterminate Western Blot results, has helped considerably in the underwriting process.

The current tests used by HORL model on the WRAIR algorithm, for HIV antibody detection, are HIV antibody ELISA confirmed by Western Blot, recombinant assay and RIPA. A specimen demonstrating results consistent with HIV infection is reactive in 2 of 3 separate ELISAs, meets the positive criteria for Western Blot, and is reactive by recombinant assay. If the results of Western Blot and recombinant assay do not agree (i.e., indeterminate Western Blot plus a positive recombinant), RIPA is used as the "gold standard" to obtain a final result.

COSTS OF HIV INFECTION

The discounted present value (at 8% interest) cost of insuring an HIV-positive individual is about $400 per $1,000 of insurance. This means for a company issuing a $100,000 policy to an asymptomatic HIV individual, the present value of the cost of that decision is $40,000. The average cost of medical treatment for an AIDS patient is in the range of $50,000-$80,000. With costs of this magnitude, HIV antibody testing is obviously of great value. I will comment more on the value of testing later in this presentation.

SURROGATE AIDS TESTS

In evaluating the AIDS risk from an insurance perspective, direct tests for the HIV antibody are most useful. Since HIV antibody testing is not allowed in all legal jurisdictions, alternate or "surrogate" testing methods are utilized by many insurers. The use of T-cell subpopulation assays, neopterin and beta 2-microglobulin are the most common of these alternative testing methods. These tests are a measure of immune system health and are not specific for HIV infection. As HIV-infected individuals progress to AIDS, immune function abnormalities arise, yielding abnormal T-cell neopterin and beta 2-microglobulin test results.

According to HORL studies, evaluation of T-cell and the beta 2-microglobulin are the two best surrogate tests. Most insurance companies use T-cell analysis where legal limitations on direct HIV antibody determinations prevail. The following table shows the 1988 HORL test results for abnormal T-cell ratios per 100,000 applicants:

Ages	Abnormal T-Cell Ratios (Per 100,000 Applicants)
20-29	2,993
30-39	2,738
40-49	2,322
50-59	2,684

NON-AIDS-RELATED TESTING

There has been a large increase in insurance testing as a result of the AIDS epidemic. There are many other tests that are done routinely as a part of blood/urine chemistry profiles that many insurance companies have found to be of great value. Some other valuable tests are for cholesterol/lipids, liver function, renal function, glucose tolerance, nicotine and drugs of abuse.

Let me give you one example of non-HIV-related testing. This example will be testing for cholesterol/lipids, a major risk factor for Coronary Heart Disease (CHD).

According to the National Heart, Lung and Blood Institute, Bethesda, Maryland, desirable levels for total cholesterol are under 200 (mg/dL), borderline high risk is total cholesterol of 200-239 (md/dL), and high risk total cholesterol would be 240 (mg/dL) and over. In 1988 HORL cholesterol test results were as follows:

Ages	Total Cholesterol Over 350 (mg/dL) (Per 100,000 Applicants)
20-29	129
30-39	270
40-49	454
50-59	561

In addition to total cholesterol, several other blood lipids were analyzed, including high-density lipoproteins (HDL), low density lipoproteins (LDL) and triglycerides. Analysis of two other lipids, apolipoprotein A-1 and apolipoprotein B-100, are also being used by many insurance companies. These additional test results help specify those most at risk for CHD.

HORL 1988 cholesterol test results over 250 (mg/dL) with cholesterol/HDL ratios over 10 were as follows:

Ages	Total Cholesterol Over 250 (mg/dL) and Cholesterol HDL Ratio Over 10 (Per 100,000 Applicants)
20-29	209
30-39	447
40-49	728
50-59	731

Several risk factors associated with CHD are:

1. Hypertension
2. Obesity
3. Hypercholesterolemia
4. Smoking
5. Age
6. Gender
7. Family History

According to the American Heart Association, the danger of heart attack is related to several risk factors; the following table illustrates some of these risk factors versus relative danger:

Risk Factors	Relative Danger
None	77%
Average	100
Cigarettes	120
Cholesterol + Cigarettes	236
High Blood Pressure + Cholesterol + Cigarettes	384

The following CHD risk factors can be obtained from a paramedical exam plus laboratory testing:

1. Medical history
2. Height/weight
3. Blood pressure
4. Cholesterol/lipid profile
5. Nicotine screen

This information provides additional information of great value regarding an applicant's CHD risk.

I thought you might also be interested in HORL's 1988 cocaine results:

Ages	Cocaine Positives (Per 100,000 Applicants)
20-29	1,483
30-39	921
40-49	385
50-59	145

VALUE OF LABORATORY TESTING

HORL is sponsoring a study to be conducted by the actuarial consulting firm of Milliman & Robertson, Inc. This study will combine HORL's large database with the underwriting value of various laboratory results to determine the protective value of laboratory testing. Of course, the use of HORL's database will include no name-linked or company-linked information. I believe this study will provide valuable information to the insurance industry while at the same time it will illustrate the protective value of laboratory testing.

In the following tables, some preliminary results of Milliman & Robertson's study are detailed:

PRELIMINARY RESULTS OF M&R/HORL STUDY

Present Value per $1,000 Issued
of Savings from Laboratory Testing by Age

	25	35	45	55
Blood Profiles	$2.09	$2.04	$2.89	$5.30
Urinalysis	0.34	0.60	1.18	1.91
Total	$2.43	$2.64	$4.07	$7.21

Protective Value of
Testing 10,000 Applicants
(Average Policy Size of $250,000)

Present Value Savings	$ 11,800,000
Cost of Testing	$ 850,000

SUMMARY

In summary, HIV infection is continuing to spread and costs to the insurance industry will likely continue to increase dramatically. Underwriting tools such as paramedical exams and laboratory testing are very important in protecting the insurance industry. The value of non-AIDS-related laboratory testing can also help offset some of the increase cost of AIDS to insurers.

DR. E. BAYNE CAREW*: I am not in the actuarial business, but I am interested in your approach to testing which tends to emphasize the correlation between all of those tests which confirm that a positive test is correct. What about those false-negatives, in other words, your inability to detect it? Those negatives may even increase or avoid any kind of surveillance if there is a substantial mutation rate in a pathogen in that case. How do you figure those things out in the statistics that you are looking at right now? Are you all that confident that what you have seen in the past is at all accurate based on present technologies of detection? And, are you all that confident, based on any kind of extrapolation that you use, that it continues to be reliable?

MR. SADLER: Good question. I am an actuary, not a laboratory scientist, but my understanding from the people in our laboratory who think about this sort of thing, is that typically the false-negatives that you might have are people on the front end who have not seroconverted yet. That is one of the reasons why I emphasize we test for HIV antibodies. If you have not seroconverted, your test is going to be negative. There is that window period in the beginning where an individual could actually be infected by the virus but not show up as having a positive test. You also have that problem at the end, when individuals have AIDS and their immune systems are compromised, that there might be some people who have negative ELISA results. Typically, for the people at the end, you are going to pick up that information from other items on the application. Our tests really are not for the people who have AIDS because if insurance underwriters are doing their job well, they will be able to pick up the actual AIDS patients without having to have the tests. So, the concern comes at the beginning; there is a school of thought that antigen testing may help with that problem. It has not panned out very well. We are always looking for ways to fill in that window period at the beginning before seroconversion, but right now it is not available. One of the advantages, if individuals know they are seropositive and they are trying to select against an insurance company, then they have seroconverted and you can pick them up. So if you are in that window period, the applicants probably also do not know that they are going to be seropositive.

DR. CAREW: How far behind the information lag are you on the real infected estimate? I know you have all expressed some interest in knowing what that is, but that kind of information is primary data that comes out of the medical community that will affect the kind of estimate that you make. I have been wondering, do you hence know something I do not know, because of the statistical analysis that you do? It seems that those of us who read the scientific literature as well as those of you doing the statistical analysis are equally in the dark on that issue.

* Dr. Carew, not a member of the sponsoring organizations, is Professor at the University of Michigan in Ann Arbor, Michigan.

MR. SADLER: I said earlier, I wish we had half as much work on HIV prevalence as we have gotten on AIDS reported cases. I think that is the kind of information we will need to answer the kinds of questions that you are asking.

MR. BLUHM: I think part of the answer to that might come down to the fact that what we are is practicing actuaries, and we have clients or companies that need an answer even if we do not have the complete knowledge. So what we are doing is throwing darts at what we think the right answer might be, but not maintaining that we know for sure what that answer is.

MR. RICHARD A. LAKE: This should be a quickie. Would anyone care to go on record or comment on the lack of testing by the individual medical carriers?

MR. SADLER: It is growing.

MR. LAKE: Are there companies really testing?

MR. SADLER: I am aware of several companies that are testing, but I am not at liberty to mention them. I will let them speak for themselves.

MR. THOMAS J. STOIBER: Regarding probably individual health insurance more than group, but it might apply to group also. All the statistics shown and what people are putting in their pricing are really based on general population statistics and what the prevalence is of HIV and all of this, and I am starting to hear companies, like my own, that are putting these deterrents on their applications, such as limitations in the contract and blood testing. In fact companies like ours do blood testing in certain locations on individual health. Has anybody any thoughts on what this does? Does this just eliminate antiselection that I think we have seen earlier, or does it actually help to give us better statistics? Will our statistics be better than population as a whole in, maybe not the next year or two, but four or five years from today?

MS. COMSTOCK: Most everybody's got the questions in their applications, but my concern is, we are not going to get good statistics unless we have got good coding in the claims end, and that seems pretty hard to accomplish.

MR. STOIBER: On the individual side, we are getting antiselected against without these questions. I could name one agent who gave us three cases. That is not general population statistics. Now with questions being asked, blood testing being made, and limitations in the policy, we have a two-year limitation in the policy so the person is not going to get anything out of us for the first two years. Does that just bring us back to population statistics for our pricing purposes, or does anybody feel that will improve our statistics to actually better than population statistics? And, is all this sort of thing very nicely academic without really meaning a whole lot when it comes down to pricing, at least on the individual side?

MS. COMSTOCK: I guess I would be inclined to think that you are not going to get better than population statistics, because of the long, latency period and the window period. I would tend not to be that optimistic.

MR. BLUHM: I would think part of it is also what your mix of business is by age, by risk category, by geographic area, and what income level of the population you are prevalent in, which you may not be able to tell. I would think that has a lot more to do with what that bottom line number is than a lot of other things.

MS. BARBARA J. LAUTZENHEISER: By better statistics, I am assuming you do not mean better in the way they are calculated, but improved ratios. Lower ratios, as to the number of persons prevalent, than in the general population. The SOA Task Force on life has indicated that the testing, just the concept of testing itself, has in fact kept people away, and that there is some evidence that those persons who knew they might be positive or suspected they might be positive are not now coming to the life insurance side as a result of the testing that is being done. So I would suspect you may get the same thing once the word is out that those individual health insurers are testing. The piece we have no data on, in this entire area, and I am not sure you can ever get concrete data the way you would like to get it as actuaries, is the behavioral factors. I keep saying I studied actuarial science for 25 years and should have studied behavioral science,

because much of what we are talking about in this issue, and in many health issues, is the behavioral factor. So, I think it will have a significant difference in the numbers that you get. Not remembering exactly some of Gregg's statistics having to do with the differences between general population and what HORL sees in their testing, I think you are suspecting most of your people did not suspect that they were being tested, which is why you get a different geographic distribution with the tested population than you do with others. So there are several indicators that show you are probably going to have fewer claims per thousand in your population than in the general population.

MS. COMSTOCK: Another thing that might happen on the individual health side is a shifting. Assuming that insurance companies get serious about going after antiselection, what we may see is a shift to HMOs A lot of HMOs offer the individual product, but it is a baby line for them and HMOs, by and large, are not screening. They just put the question on the application, and that is about it. So, that may be something that might happen then, until everybody gets serious about avoiding antiselection. There might be a shift to those who are not.