AN APPROACH TO THE PRICING AND VALUATION OF A SOCIAL INSURANCE SUPPLEMENT TO DISABILITY INCOME POLICIES

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ABSTRACT

A social insurance supplement (SIS) is a disability income policy rider that pays an additional benefit if the insured is disabled and not receiving benefits from social security or any other named social insurance program.

Many approximations and elements of judgment are required in the pricing and valuation of this product, since little actual experience is available as yet. This paper provides one possible framework for the actuarial structure of the product and suggests a few of the problems that may be encountered. It is meant primarily for the reader who wishes to become familiar with products of this type and to consider the actuarial implications of their provisions.

This paper does not include any technical detail, nor is there a discussion of the effects of varying any assumptions. It is hoped that others may be encouraged to pursue these aspects and to quantify the effects of many of the considerations described.

A SOCIAL insurance supplement (SIS) is an attempted solution to the problem of overinsurance in individual disability income coverage. By providing benefits only when social security disability payments (and sometimes workmen's compensation and no-fault automobile insurance) are not payable, an SIS furnishes a means for issuing adequate coverage on a reasonable basis.

I. DESCRIPTION OF BENEFITS

The product my company is issuing is similar to several others currently in use. It is in the form of a rider to be attached to a noncancelable or guaranteed renewable disability income policy. Renewability is the same as for the base policy, and the elimination and benefit periods are also the same. In this paper the term *elimination period* denotes the period following disablement during which benefits are not paid, as stated in the insurance contract. The term *waiting period* refers to a similar period for social insurance.

The amount of monthly income for the rider is stated separately on the policy schedule page. This amount is payable, on an "all or nothing" basis, if the insured is totally disabled under the terms of the basic policy and if benefits under "other programs" are not payable. Other programs are defined as social security, workers' compensation, and in some states no-fault automobile insurance. To receive income under the rider, the insured must submit evidence that he has applied for the appropriate social insurance benefits for which he is eligible and that, if these benefits were denied, a timely appeal or request for rehearing was filed. Benefits are paid under the rider during any waiting period after the elimination period and until benefits under a social insurance program are actually received. If retroactive or lump-sum social insurance payments are made, there is no offset against rider benefits already paid. If social insurance payments cease for any reason while the insured is still totally disabled and before the end of the benefit period, payments resume under the rider. The rider terminates at age 65 or when social security retirement benefits begin, if earlier.

Other provisions of the rider allow the insured to increase or decrease benefits under certain limited circumstances, such as when his social security status or eligibility changes. If the rider benefits are reduced, a new base policy of a corresponding amount may be purchased without medical underwriting. In case of drastic legislative changes or foreign residency, the premium for the rider (even if noncancelable) may be increased, but only up to the rate of the base policy.

The rider also provides that if total disability is the result of the loss of sight or hearing or the loss of use of two limbs then benefits are payable under the rider regardless of whether any social insurance benefits are payable.

II. PRINCIPAL DIFFERENCES BETWEEN THE SOCIAL SECURITY DISABILITY INSURANCE (SSDI) PROGRAM AND PRIVATE INDIVIDUAL DISABILITY INCOME (IDI) INSURANCE

The most significant differences between the disabled worker benefits under the United States old-age, survivors, and disability insurance system and those under typical individual disability income policies issued by private health insurers are in the definitions of total disability. Under SSDI, the disability must be medically determinable, must be expected to last at least twelve months or to result in death, and must effectively prevent the individual from engaging in any substantial occupation within the work force of the United States. IDI, on the other hand, typically requires only that the insured, as a result of accident or

sickness, be "unable to perform all of the material and substantial duties of any occupation" for which he is "reasonably fitted by education, training or experience." (The words in quotation marks are from my company's policy form.) For a certain stated period of disability, which may vary from twenty-four to sixty or more months or to an age such as 55 or 65, the insured is required only to be unable to perform all of the substantial and material duties of his regular occupation. In addition, regular attendance by a physician is required.

The waiting period for SSDI is fixed at five calendar months. This period begins on the first day of the month following disablement, and in order to receive the first monthly benefit the beneficiary must live to the end of the calendar month following the waiting period. Thus, even if the claim is filed, approved, and paid promptly (which frequently is not the case), the waiting period actually is equivalent to six to seven months. In IDI the elimination period is chosen by the applicant and is commonly seven or fourteen days but may be thirty days or longer. It is measured from the actual date of disablement and sometimes is waived for disabilities due to accident.

The maximum benefit period in IDI also is a plan option. It typically is two years, five years, or to age 65, and may be longer if disability is due to accident rather than sickness. In SSDI, the benefit ends when social security retirement benefits begin. This could be at age 65, or as early as age 62 on an actuarially reduced basis. After a beneficiary has been receiving disability benefits for two years or more, he is eligible for medicare even if under age 65 (this may have some effect on recovery rates).

SSDI makes no distinction as to cause of disability or whether the disability is due to sickness or accident. Frequently under IDI preexisting conditions are excluded for a two-year period following issue and there is a short list of exclusions.

The amount issued under IDI is determined by the applicant and the company's underwriting rules, which take account of the insured's income. Under SSDI, the eligible beneficiary receives the primary insurance amount (PIA), which is related to his "average monthly wage," and also may qualify for family benefits. To be eligible, a worker must be both "fully insured" and "disability insured"; these statuses are dependent on requirements relating to minimum earnings and recent connection with the labor force.

An important provision of IDI is the "recurrent disability" clause, under which different periods of disability are considered the same unless separated by a minimum period such as ninety days. Under SSDI, if a

beneficiary recovers and returns to work for even one day, he must fulfill a new five-month waiting period.

Finally, IDI frequently contains partial disability and similar benefits not present in SSDI.

The enumeration above is not meant to be exhaustive but is intended merely to point out those distinctions between SSDI and IDI that are most pertinent to the design, pricing, and administration of a product such as a social insurance supplement rider.

III. DERIVATION OF PRELIMINARY EXPECTED CLAIM COSTS

It will be assumed that a suitable basis has been chosen for the claim costs of the basic disability income benefit exclusive of partial disability and other ancillary benefits not present in SSDI. Also, for the present, we shall ignore the possible reduction in the SIS claim costs due to the offset of workers' compensation and no-fault disability benefits.

Assume that for the first m months after disablement, where m is some number equal to or greater than $6\frac{1}{2}$, the supplemental benefits are certain to be paid provided that the insured is still disabled. For disabilities lasting beyond m months the expected cost of such benefits must be multiplied by the conditional probability that SSDI will not pay any benefits although the insured is disabled under the terms of the policy. Thus the SIS claim costs usually consist of an A and a B portion, where S_x^A is the claim cost, on the basis already assumed, for disability from the end of the elimination period to m months after disablement, and S_x^B is the corresponding cost from m months after disablement to the end of the benefit period. Then the total claim cost can be expressed in the form

$$S_x^{\text{SIS}} = S_x^A + p(x)S_x^B , \tag{1}$$

where $p(x)$ is the conditional probability referred to above. If the elimination period is greater than m, only the B term appears; if the benefit period is less than m, only the A term appears—in this case there is no reduction for SSDI.

Determination of m

The ultimate determination of m should be made from experience under this benefit, since the author is unaware of any published data giving the time lag between onset of disability and the date social security benefit payments begin. As a first approximation, I used nine months to allow for reasonable delays after the expiration of the statutory waiting period. Consideration also should be given to appeals, which may be granted after considerable delay, and to the fact that doubtful cases may be granted

benefits shortly after the twelve-month period used to determine qualification for benefits.

Determination of $p(x)$

The value of $p(x)$ may be determined from the following formula:

$$p(x) = \frac{r_x^{IDI} - r_x^{SSDI}}{r_x^{IDI}}$$

(2)

$$= 1 - \frac{r_x^{SSDI}}{r_x^{IDI}},$$

where r_x^{SSDI} is the incidence rate of disability awards under social security; r_x^{IDI} is the incidence rate under individual disability insurance for the corresponding attained age, class, and similar elimination period; and the variable x suggests that $p(x)$ may vary not only by attained age but also by sex and occupation class. A floor of f, where f is given a value not less than zero, is assumed for $p(x)$ for reasons discussed later.

One source of data for r_x^{SSDI} is Table 10 (pp. 53–54) of *Reports of Consultants on Actuarial and Definitional Aspects of Social Security Disability Insurance* by John H. Miller, published in 1976 by the United States Government Printing Office. A more recent source is *Experience of Disabled-Worker Benefits under OASDI, 1972–76* (Actuarial Study No. 75) by Francisco Bayo, Stephen Goss, and Samuel Weissman, published in 1978 by the Department of Health, Education, and Welfare. Tables 3 and 4 (pp. 18–19) of this publication are most useful; however, if occupational data are desired, the Miller reports should be used. As described by Mr. Miller, the occupational groupings were derived from 1970 census reports and the report *Social Security Disability Applicant Statistics* by Philip R. Lerner published in 1970 by HEW. The groupings for men are nonhazardous occupations, hazardous occupations or industries, and all others. (Women employed in hazardous industries were not considered to be subject to as much of the occupational hazard as men, and their data were included in the nonhazardous group.) Thus the table furnishes an indication of the relative incidence rates among occupational groups. How these categories relate to the occupational classes assigned by the underwriters of an insurance company is a matter of individual judgment, but it must be remembered that SSDI coverage is virtually universal, while there are a great many uninsurable occupations under IDI.

To calculate r_x^{IDI}, the experience of your own company should be used if available. Otherwise, the incidence rates given in the *TSA Reports* on experience under individual loss-of-time policies may be used. In any case

an appropriate continuance table should be used to derive the rates for an elimination period of six and one-half months.

To eliminate the possibly differing effects of secular trends, both r_x^{SSDI} and r_x^{IDI} should refer to experience of the same period. If desired, both sets of rates may be extrapolated to the period in the future when the proposed premiums are expected to be in effect.

It may be found that in some instances r_x^{SSDI} is greater than r_x^{IDI}, necessitating the establishment of a floor for the value of $p(x)$. One possible reason for this result may be a faulty assumption as to the distribution of SSDI incidence by occupational class. Since SSDI coverage is virtually universal, it is necessary to exclude those occupations that would be uninsurable under IDI. Also, SSDI covers risks, medical and otherwise,

TABLE 1

REPRESENTATIVE VALUES OF $p(x)$

AGE AT ISSUE	MALE		FEMALE	
	Occupational Class 4A	Occupational Class A	Occupational Class 4A	Occupational Class A
25.........	.80	.58	.85	.75
30.........	.68	.48	.70	.59
35.........	.58	.40	.57	.45
40.........	.48	.40	.55	.42
45.........	.40	.40	.53	.40
50.........	.40	.40	.46	.40
55 and over	.40	.40	.40	.40

that would be substandard, excluded, or declined under IDI. The inclusion of these risks increases the value of r_x^{SSDI}, so that it is not strictly comparable to the r_x^{IDI} used in the calculation of $p(x)$ by formula (2). For approximate use, the assumption of a reasonable floor for $p(x)$ is appropriate.

The representative values for $p(x)$ shown in Table 1 should be considered only as illustrative, since many of the assumptions may not be appropriate for all companies or all products.

Some of the assumptions used in deriving the values in this table are as follows:

1. For r_x^{SSDI}, the values for occupational class 4A are those for nonhazardous occupations from Table 10 of the Miller reports. The values for occupational class A are from the "all others" category in the same source. Hazardous occupations were omitted completely, since many would not be considered insurable.

2. For r_x^{IDI}, values were derived by taking the annual claim rates in Table 5 (p. 147) of *TSA, 1975 Reports* and adjusting them to a six-month elimination period by using the continuance table underlying the 1964 Commissioners Disability Table. Occupational group I was used for class 4A and occupational group II for class A. Rates for female occupational group II were estimated by multiplying the rates for female group I by the ratio of the male group II rates to the male group I rates.
3. Both sets of data refer to approximately the same time period (calendar year 1972 for r_x^{SSDI} and 1972–73 for r_x^{IDI}). No attempt was made to extend the data forward, on the assumption that the trends would be similar for SSDI and IDI.
4. For conservatism, a floor of 0.40 was put on values of $p(x)$. A lower floor, of course, will produce lower claim costs for certain values.

Total preliminary expected claim costs for the representative ages and occupational classes may be derived using formula (1), where S_x^A and S_x^B are calculated for the appropriate elimination and benefit periods using the assumed basis for disability income claim costs. Claim costs for other ages may be derived by interpolation. For each age, claim costs for missing occupational classes may be obtained by interpolation or by applying any desired relationship between classes.

IV. POSSIBLE MODIFICATIONS OF CLAIM COSTS AND DERIVATION OF GROSS PREMIUMS

The preliminary expected claim costs derived as described in the previous section may be modified for several reasons.

Offset of Workers' Compensation and No-Fault Automobile Insurance Benefits

Approximate methods may be used to make this modification in the absence of sufficient experience. Some of the points to be kept in mind are the following:

1. No-fault is available only in a limited number of states.
2. Under both no-fault and workers' compensation, the amount of benefits may vary considerably from state to state.
3. Under both programs, compensation for disability sometimes is made on a lump-sum basis. By the terms of the SIS rider, such a settlement does not affect rider benefits.
4. Only benefits for disability of the insured are considered. Benefits for hospital or medical expense, for example, do not affect benefits under the rider.
5. The timing of the initial approval and the actual receipt of periodic disability payments differs from that under SSDI.

Additional Benefits Included in SIS Rider

An example of an additional benefit included in an SIS rider is one providing for presumed disability for loss of sight or hearing or double dismemberment. The extra cost attributable to this and similar benefits may be evaluated by methods similar to those used when these benefits are included in the base policy. Specific formulas are beyond the scope of this paper.

Derivation of Gross Premiums

Once the expected claim costs, with all the modifications desired, have been determined, the gross premiums for the rider may be derived by any of a number of conventional methods that will not be described in detail here. However, certain relevant points are worth mentioning:

1. When a rider is priced, the fixed "per policy" expenses frequently are ignored, since they are assumed to be covered in the base policy rates. In the case of an SIS rider, the average monthly income that was assumed in the base policy rates should be examined. The presence of the rider may result in a lower average size for the base policy (but a higher total monthly income for base policy and rider combined). Therefore, some provision may be made in the rider premium for part of the fixed expenses.
2. Provision should be made for the additional claim administration expense associated with investigating whether the claimant is eligible for social insurance programs and whether in fact, he is not receiving benefits.
3. If the method of computing gross premiums depends on the emergence of statutory or GAAP profit after a specified number of years, some assumption must be made in the method of determining active life reserves. One such method is discussed in the following section.

V. RESERVES AND LIABILITIES

Active Life Reserves

Active life reserves for GAAP statements may be calculated directly by using the claim costs developed in the derivation of rates. These claim costs also may be used for statutory reserves, provided that the basis used for morbidity is an approved table. One procedure for valuation is as follows:

1. Using a predetermined value for m, divide each SIS rider into an A and a B portion according to the elimination and benefit periods, as described in Section III. (As mentioned, there may be cases where only the A portion or only the B portion appears.)
2. Calculate reserves on each portion separately, using the valuation assumptions and procedures for disability income policies.

3. Multiply the B reserves by the appropriate value of $p(x)$ and add to the A reserves.

One simplification that may be desired is to use a conservative average value of $p(x)$ to avoid the extensive modification of the valuation system that may be necessary to incorporate the choice of the correct value into the system. For example, a constant $p(x)$ equal to 0.8 would yield conservatively high reserves for all but the most unusual distributions if the actual values are as shown in Table 1. A further simplification that might be used would be to apply a factor to the entire total reserve without splitting it into two parts; however, this would be appropriate only if the business does not vary significantly by elimination period and benefit period and if the values used for $p(x)$ do not vary too widely.

Disabled Life Reserves and Claim Liabilities

On reported claims certain information that is known to the claim examiner should be coded on the record. Thus, if it is known that the claimant is receiving no-fault or workers' compensation disability payments, this fact should be noted as well as the probable maximum duration of such payments. Also, if it is known that social security has denied finally both the application for benefits and the appeal on an existing claim, then this fact should be noted.

Let m' be a number of months greater than m, such that after m' months following disablement it is considered virtually certain that benefits will not be paid under SSDI. For example, m' may be equal to 18. Let p' be defined as follows:

$$p' = 1 \qquad \text{if claim duration} \geq m'$$
$$= 1 \qquad \text{if social security denial is on the record}$$
$$= p(x) \qquad \text{otherwise.}$$

In the cases where p' equals $p(x)$, either the exact values or an approximate average value of $p(x)$ may be used. If an average value is used it need not be the same as that used to calculate the active life reserves; a more realistic value may be used. Also, it may be desired to grade p' into 1 as the claim duration approaches m'.

Where it is not known whether the claimant is receiving other social insurance payments, the liability for claims due and unpaid and in course of settlement and the reserve for the present value of amounts not yet due for reported claims are the amounts that would otherwise be established for disability income multiplied by the factor p'. If the claimant is presently

receiving social security payments, then perhaps no liability or reserve need be set up, since the probability is remote that the social security payments will stop while the insured still meets the definition of disability under the policy or rider. If the claimant is presently receiving no-fault or workers' compensation disability payments, a reserve is required only if the rider benefit period is greater than the probable duration of existing benefits. Such a reserve would be based on a deferred disabled life annuity multiplied by a p' factor based on the present duration of disability.

To summarize, a disabled life reserve probably is not needed when the claimant is receiving benefits from a social insurance program. (Only the possibility that social insurance payments will cease while the claimant is still eligible under the rider need be considered.) If the claimant is not receiving such benefits and it appears unlikely that such benefits will be paid (social security appeal denied; disability not due to automobile or industrial accident), then the full reserve for a disability income claim is established. Only during the waiting period or while an appeal is pending should the disabled life reserve be reduced by an appropriate factor.

For claims incurred but not reported, the liabilities and reserves may be calculated by any appropriate method. If the product is issued as a rider with at least some unconditional disability coverage always present under the base policy, the reporting lag time is not expected to be significantly different than if the rider were not present. Companies issuing this benefit as a "stand-alone" policy should be aware that the reporting lag time may be greater than for regular disability income coverage.

VI. CONCLUSION

Many other approaches are possible that differ from the ones suggested in this paper, and many other variations of the SIS product are certain to appear. A starting point has been defined, based on the most common current version of the product. However, many problems remain and numerous refinements can be made. It is hoped that a discussion can be generated that will point to solutions still needed. It also would be helpful if experience data for this type of rider were to be presented.

DISCUSSION OF PRECEDING PAPER

BRUCE D. SCHOBEL:

Mr. Halpern has provided a useful framework on which to build a disability income policy that would supplement social insurance benefits. The type of policy rider described would provide important benefits and, at the same time, avoid the serious problem of overinsurance that can occur when even small amounts of individual disability income benefits are added to the substantial benefits that may be available from social security and other sources.

The cost of a social insurance supplement is very sensitive to the number of months (m) from onset of disability to the date of award of social security disability insurance (SSDI) benefits. The Social Security Administration produces a monthly report on the number of months from date of entitlement to date of award. Table 1 of this discussion shows data for September, 1979.

The average length of time from entitlement to award has varied from about five to seven months since 1972. During periods of high disability incidence, the number of months from entitlement to award has tended to increase, reflecting heavier work loads. In 1978 and 1979 the gross disability incidence rate has decreased, and the number of months from entitlement to award has also decreased, although not as dramatically as the incidence rate, which for 1979 probably will be the lowest in fifteen years.

The date of entitlement is usually, but not necessarily, five months after the date of onset of disability. A Social Security Administration study of a 2 percent sample of disability insurance applications for July, 1968–December, 1971, showed that many applicants waited a year or longer after disability onset before filing for benefits. Since a maximum of twelve months of retroactive payments may be made for the period preceding filing, some of these applicants lost months of entitlement. All those who waited more than two years lost at least seven months of benefits.

Table 2 shows the percentages of applicants and initial allowances filing within one and two years of onset for selected impairment classifications. The table indicates that many disabled individuals were not aware of their eligibility for SSDI benefits during the observation period, July, 1968–December, 1971. More recent data are not available, but one might speculate that the corresponding percentages today would be con-

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siderably higher. In fact, the data shown are not relevant to the particular product Mr. Halpern describes, since an application for SSDI benefits is a requirement, and, in any case, awareness of SSDI may be presumed for most purchasers of social insurance supplements.

An insurer planning to market a social insurance supplement policy or rider should be aware of the long delay possible from date of disability onset to actual award of SSDI benefits. In addition, the correla-

TABLE 1

SOCIAL SECURITY DISABILITY INSURANCE

Number of Months from Date of Entitlement to Date of Award:
September, 1979 Awards

No. of Months from Entitlement to Award	No. of Awards (%)	Amount of Awards (%)	No. of Months from Entitlement to Award	No. of Awards (%)	Amount of Awards (%)
0.	28.03%	28.53%	13.	1.69%	1.73%
1.	7.84	7.99	14.	2.19	2.12
2.	7.73	7.90	15.	2.64	2.39
3.	6.95	7.30	16.	1.97	1.79
4.	5.12	5.51	17.	1.56	1.42
5.	4.66	4.91	18.	1.29	1.09
6.	4.08	4.15	19.	0.82	0.71
7.	3.47	3.68	20.	0.73	0.62
8.	3.08	3.21	21.	0.69	0.64
9.	3.17	3.15	22.	0.41	0.39
10.	2.60	2.57	23.	0.51	0.43
11.	2.23	2.21	24.	0.57	0.48
12.	2.11	2.02	25+.	3.84	3.06

TABLE 2

TIME LAG FROM DATE OF ONSET TO DATE OF FILING
FOR SOCIAL SECURITY DISABILITY INSURANCE

IMPAIRMENT CLASSIFICATION	% FILING WITHIN ONE YEAR		% FILING WITHIN TWO YEARS	
	Applicants	Initial Allowances*	Applicants	Initial Allowances*
Psychiatric.	63%	48%	79%	66%
Cardiovascular. .	77	81	87	90
Musculoskeletal.	71	74	86	89
Respiratory.	77	82	87	91
Neurological. . . .	77	81	87	89

* Those whose benefits were approved without a reconsideration or appeal.

tion between incidence rate and award time lag has important cost implications. In times of increasing disability incidence rates, the claim costs of the supplemental policy will increase faster than the disability incidence rate because of the increased delay expected before social security benefits begin.

Mr. Halpern points out the problems of applying DI incidence experience directly in the pricing of a supplemental policy because of differences in occupations covered. Unfortunately, the most recent DI incidence data have no occupational breakdown. An actuary must use his own judgment in determining expected disability incidence; in this respect, a social insurance supplement is no different from any other disability income policy.

Mr. Halpern makes two minor factual errors in his description of the SSDI program. Although reduced retirement benefits are available at age 62, SSDI benefits continue until attainment of age 65. Also, a recovered beneficiary who becomes disabled again within five years of recovery does not have to fulfill a second waiting period.

(AUTHOR'S REVIEW OF DISCUSSION)

EMANUEL HALPERN:

My thanks to Mr. Schobel for submitting an interesting and enlightening discussion of this paper. Much of the information provided by Mr. Schobel should prove quite useful to actuaries dealing with various disability income products.

The data given in his table on the period of time between date of entitlement and date of award produce an average of 6.14 months, by number of awards, assuming no period longer than twenty-five months. When this is added to the five-month waiting period, and the approximately one-half month from the actual date of disablement to the beginning of the next calendar month when the waiting period starts, it would seem that a value for m (the period after which supplemental benefits are assumed certain to be paid) of nearly twelve months is appropriate. However, as Mr. Schobel points out, this figure is distorted by the fact that many applicants wait until long after they are eligible before filing for benefits. If the company will administer strictly the policy provision that requires timely filing for social insurance benefits, the actuary may safely assume that the average value of m will be substantially lower than the data indicate. Of course, the lower the assumed value of m, the lower the premium rate. My original assumption of nine months may well prove, however, to be too low.

Mr. Schobel's remarks about the correlation between the rate of disability incidence and the length of time between entitlement and award are quite interesting. I wonder whether this phenomenon could be due entirely to the increased work load on the social security staff, as he suggests. Perhaps in times of economic stress or of increased information or awareness, more marginal and borderline claimants will file for benefits, requiring longer processing time. At any rate, this would tend to compound any adverse experience under social insurance supplement (SIS) riders.

The downward trend over the last two years in the disability incidence rate is indeed encouraging. I think it is due at least partly to stricter administration and guidelines of the Social Security Administration and the desire of Congress to keep the cost of the program down. However, it emphasizes the caution that must be exercised in the rating of SIS products. Undue reliance must not be placed on past trends.

Finally, I wish to thank Mr. Schobel for setting me straight on the details of the SSDI program. It was not my intention to make an exhaustive description of the system, but I certainly did not mean to let any factual errors creep in.