The Essential Factors in the Computation of the Cost of Workmen's Compensation.*

W. N. MAGOUN.

Had the originator of the saying, "Comparisons are odious," ever heard of the subject of workmen's compensation, he would have been more likely to have said, "Comparisons are essential."

"The function of statistics in social studies is to afford a definite quantitative measure of forces and tendencies concerning which there are conflicting opinions because of the wide fluctuations occurring in the narrow field of the individual observer's experience or knowledge." This definition which I quoted is from the report of the Commission on Compensation for Industrial Accidents of Massachusetts, which Commission drafted our Compensation Statute and carried out the investigations and preliminary work in connection therewith.

With the extraordinary demand which now exists all over this country for accurate and dependable information in respect to workmen's compensation on the one hand, and the meager contribution which any one state is able to make on the other, the necessity for uniformity in the keeping of statistical data so that it may be interchangeable, stands out clearly.

Owing to the differences in the laws in the various states, it will be natural for each state to find it necessary to keep certain data peculiar to itself. This, however, should not operate to prevent the general handling of the subject on a uniform basis.

I will admit at the outset that if we are to become uniform in our methods it will involve two concessions on the part of many of us.

First, we shall have to keep a certain amount of data over and above that which we believe we need for our own use.

Second, we shall have to change to a greater or less extent some of the tables which we are at present using.

As an illustration of the first point, I may mention that in Massachusetts a widow is paid for 500 weeks, and consequently her age is

* Read before the National Association of Industrial Accident Boards and Commissions, Chicago, January 12, 1915.

of no great importance under our statute. I believe we should tabulate such information however for the benefit of others, on the principle of give and take, and if, in the future, it should be proposed to amend our law to cover payments to a widow for life, we should be very glad that we had our statistics, so that accurate information as to what such a change would cost would be available.

In regard to the second point, I realize that a change in tabular presentations is a serious mattter, as one year's experience cannot be compared with another year's unless the basis is the same. We may, for the time being, to some extent conflict with our own older statistical records, but if we are ever to accomplish uniformity, the sooner it is brought about the better, and that is the chief reason for this discussion.

The principal idea which I wish to present to you, and which I believe is reasonable and practicable, is this.

The National Association of Industrial Accident Boards and Commissions in conjunction with others who are closely identified with workmen's compensation could, I believe, advantageously consider the advisability of adopting and publishing a standard text-book on the subject of the fundamentals of workmen's compensation and industrial accident statistics. A committee might be appointed with full authority to prepare such a book which would have such a standing that it would be recognized as the one authority of the country on the subject of the preparation of industrial accident data.

While no time should be lost if the idea is to be carried out, sufficient thought should be given to the matter to insure a careful and accurate analysis of the essential factors necessary, and if need be expert actuarial advice should be secured.

There are four main divisions into which the subject falls, namely:

1. Uniform Tables for the Establishment of Compensation Costs.
2. The Uniform Classification of Industries.
3. The Uniform Classification of Causes of Injuries.
4. The Uniform Classification of Nature of Injuries.

None of these present a new field, and considerable work has been and is being accomplished in respect to each of them.

Dr. Royal Meeker, the United States Commissioner of Labor Statistics, is deeply interested in the subject, and through his efforts

committees are at work on the problems.* These committees are not only friendly with this organization, but there is an actual interrelationship. Cooperation in this direction may therefore be confidently expected.

That any intelligent effort toward uniformity in accident statistics will receive the endorsement of public organizations like the National Civic Federation I believe goes without saying. Mr. Cyrus W. Phillips, Chairman of the Joint Commission to Study Operation State Laws, representing the Department of Compensation for Industrial Accidents and Their Prevention, National Civic Federation, will have something to say at this conference along this line. There is a universal demand for uniform statistics, but as yet the foundation is not laid, on the substantial basis, and with the official endorsement necessary for complete success.

The Workmen's Compensation Service Bureau of New York has, through its statistical committee, issued a report on the compilation of workmen's compensation statistics including the necessary codes for the convenient handling of statistical data in connection with the punch card system. This report was the result of a considerable amount of careful study and investigation, and I see no reason why its principal divisions as to age periods and the like could not be utilized by this organization. If there are certain points wherein a difference of opinion arises, as there may be for example in the classification of causes of accidents, the sooner an adjustment and agreement is reached the better, for we must if possible all get together for the good of the cause.

As a representative of the Workmen's Compensation Service Bureau is on the committees appointed by Dr. Meeker, that Bureau will have an opportunity to be heard and also to learn the point of view of those committees which, as I have just outlined, are representative of the Federal Government, state departments, insurance interests and safety councils.

* On the committees appointed by Dr. Meeker there are representatives of the United States Bureau of the Census, Interstate Commerce Commission, Bureau of Mines,—State Industrial Accident Commissions, Insurance Departments, and Labor Departments,—insurance companies,—the Workmen's Compensation Service Bureau,—and the National Council for Industrial Safety.

The Uniform Classification of Industries.

(*See Exhibit A.*)

Of the four divisions to which I have referred, probably the most important is the Classification of Industries, as to this all the others relate. That is to say, we want to know the cost of compensation and the details of accident frequency by each industrial classification, and we also want to know the causes and the nature of injuries by industrial classifications.

The fundamental basis therefore is a clear, logical arrangement of all the varied industries of the United States into groups in accordance with the nature of the business and the degree of risk of injury.

The committee appointed by Dr. Meeker to consider this subject has tentatively adopted the following eight primary groups:

1. Agriculture.
2. Extraction of Minerals.
3. Manufactures.
4. Construction.
5. Transportation and Public Utilities.
6. Trade.
7. Service.
8. Miscellaneous.

These have been subdivided into fifty secondary groups.

There is a manual of workmen's compensation rates and classifications issued by the Workmen's Compensation Service Bureau of New York, and known as the Basis Manual, with which you are all familiar. Upwards of 1,500 classifications appear in this manual which is intended to cover every conceivable line of industrial endeavor in this country.

It goes without saying that such a refinement in classifications is impossible for statistical purposes in general. The United States Census Bureau or the state industrial accident boards do not want their tables of accident data separated into 1,500 items. We must recognize, however, that for better or for worse from the insurance standpoint this minute refinement has been universally adopted in this country, and seems likely for the present at least to continue as the accepted method of classifying industries for rate making purposes.

The practical question it seems to me, therefore, is whether these

classifications as they stand to-day can be so combined or grouped under a reasonable number of headings (say for example 300) as to be conveniently handled.

Starting therefore with the eight primary headings, divided into 50 secondary headings, we are confronted with the somewhat laborious but by no means impossible task of establishing a series of tertiary headings which will in turn cover all the manual classifications, each tertiary heading covering a group of classifications which are of analogous nature and hazard so far as present experience shows. As time goes on, corrections and additions will of necessity be made.

Just to illustrate one "series group," let us take the following:

Primary heading	2,000	*Manufactures.*
Secondary heading	3,200	Chemicals and Allied Products.
Tertiary heading	3,210	*Acids and Chemicals.*
Manual classifications	3,211	Acid Mfg. (n. o. c.).
	3,212	Analytical Chemists.
	3,213	Sulphur Mfg.
	3,214	Vitriol Mfg.

If an agreement can be reached on the tertiary headings so that these are acceptable to the various organizations interested, I feel that a long step will have been taken in the direction of uniformity. This is essentially work for a competent committee, and the results obtained should find a place in such a standard text-book as I have already mentioned, and be given the widest publicity possible.

One other thought in connection with this question of classifications. Every classification should have a code number which should be utilized to the fullest extent. I believe that such number should appear on every workmen's compensation insurance policy issued, and this would be even more valuable if more than one classification is used in the same policy as frequently happens. This code number would assist the various departments of an insurance company, such as the auditing department, claim department and the statistical department, and tend to prevent errors and possible misunderstandings between them.

The standard accident blank should provide a place for the code number, and in all states where the insurance company is required to report accidents to the industrial accident commission, such number should appear, and any dispute which might arise in the matter

of classifying could be straightened out before it was too late. In other words, the insurance companies and industrial accident commissions would thus be assured of classifying each accident in identically the same manner.

The Uniform Classification of Causes of Injuries.

(*See Exhibit B.*)

The uniform classification of causes of injuries I will not touch upon other than to say that if an agreement can be reached whereby a standard list of causes is adopted, it will serve as an important link in the chain of uniformity. This feature should have a very direct bearing on the most important phase of workmen's compensation, namely, the prevention of accidents. If through uniform statistics it is shown, for example, that in California there are only half as many accidents per unit of exposure from a specified cause as in Ohio, then Ohio can investigate the reason and learn from California just what measures have been adopted in that state, affecting such causes of accidents. No doubt reciprocity would be in order, and where a given cause shows an exceedingly low rate of accidents in Ohio, that state can give others the benefit of its experience in that particular line. No such result will be possible, however, unless the classification of causes is uniform, and consequently the data comparable between the various states.

The development of systems of merit discounts based on the physical conditions of plants, will be greatly assisted as regards the accurate measurement of the relative allowances by uniform tables setting forth in detail the cause of the accidents which occur.

The Uniform Classification of Nature of Injuries.

The uniform classification of nature of injuries means merely an agreement to tabulate the data in respect thereto according to an accepted list. Where the punch card system of tabulation is used, and the different details coded, a large variety of "natures of injury" can easily be recorded. In states which do not care for this detail for their own use, no great additional labor is involved in keeping the records, and by combining various items, the total list may be materially reduced if desired.

Uniform Tables for the Establishment of Workmen's Compensation Costs.

(*See Exhibit C.*)

The analysis of workmen's compensation experience falls naturally into two divisions:

(*a*) The work of obtaining the net loss cost or pure premium for each industrial classification.

(*b*) The detailed analysis of claim statistics.

These two divisions are separate and distinct, the starting point being the same however in that the losses are distributed under the same general headings as to what may be termed "Class of Benefit," namely:

(*a*) Death.
(*b*) Specified Injuries.
(*c*) Permanent Total Disability.
(*d*) Permanent Partial Disability.
(*e*) Temporary Disability
(*f*) Medical and Hospital Services.

The purpose in compiling the statistics in the first division is to ascertain the net loss cost of accidents which *have occurred* in the numerous classifications in order to determine the basis for the establishment of a proper compensation rate. Special Massachusetts Schedule Z fulfills this purpose.

The Massachusetts Insurance Department has just now received the third series of Schedules Z. Massachusetts was the first state to establish a schedule of this nature, and while many of you are familiar with it, I will briefly describe it for the benefit of any who may not know just what its purpose is.

Each insurance company authorized to transact workmen's compensation business in the state is required to report its experience to the Massachusetts Insurance Department on Schedule Z. The columns of this schedule are as follows:

1. The classification of industries following exactly the manual classifications of the insurance companies.

2. The audited payrolls upon which premiums are based.

3. The audited earned premiums.

4. The incurred losses subdivided to show the losses paid and outstanding in respect to the various classes of benefit.

5. The pure premium or net loss cost which is obtained by dividing the losses incurred by the audited earned payrolls and multiplying by 100. That is, you arrive at the cost per $100 of payroll for paying for the losses classification by classification.

The returns relate only to terminated policies so that the experience is divided by policy years, and the payroll is the actual payroll for the period as shown upon audit. The calendar years are of little significance to insurance companies. The policy year, or year of account, is the basis of their data, and this should be recognized as of vital importance in calling upon insurance companies for statistical data of all kinds. An attempt to observe claim statistics by calendar years in which the accidents occur regardless of the dates of issue of the insurance policies loses the advantage of a possible comparison of claim information with payroll exposures.

Owing to the fact, however, that necessarily it will take many years to definitely establish a pure premium in the smaller classifications in each individual state, there will always be a demand for "outside" experience for comparative purposes.

The idea of comparing accident statistics gathered in different parts of the world or even of this country suggests at once the necessity of adjustments to offset the difference in conditions, so that the comparison may be a true one.

Two factors enter into such a calculation.

(*a*) The difference in the laws of the two states which is reflected in the cost of the individual accident.

(*b*) The effect of the variation in industrial conditions on the frequency of accidents.

If the pure premium for *Bakers* in Massachusetts is 35 cents, and in Wisconsin 52 cents, the comparison is misleading unless we adjust the two pure premiums by suitable allowance for these two factors, viz., the difference in the benefit provisions of the two laws, and the actual though admittedly somewhat intangible variation in the physical and moral conditions in the industries of the two states. Such factors as the rigidity of factory laws, the attitude of employers toward safeguarding, etc., may be cited as an illustration. (The introduction of merit rating for physical and moral conditions will tend to discount these differences.)

Statistics of accident frequency should undoubtedly be computed on the basis of the number of "man-hours" worked as the standard

unit. Such data not being at present obtainable, the best substitute seems to be the earned payroll basis, which reflects the hours of work, but contains the element of variation in wages. For example, the payroll for 100,000 hours work in a machine shop in Wisconsin would probably not be identical with the payroll for 100,000 hours work in a machine shop in Massachusetts, and to the extent that it varies, the accident frequency table is inaccurate, if based upon payroll.

It is furthermore probable that if experience shows that accidents occur in general, more frequently in state "A" than in state "B," some individual industries within those states will show just the opposite result. Too much importance therefore in my opinion must not be given to the present available statistics of accident frequency. It is probably wise to accumulate such data, however, against the future, when a sufficient amount of data is available to be reliable. We are at the present time obliged to rely largely upon foreign experience in respect to accident frequency, and for this experience we are certainly grateful, but as "home" experience develops, and in New York especially it will develop very rapidly, we shall accumulate data of our own, based purely upon American conditions.

The aim of workmen's compensation statisticians should, I believe, be to so tabulate their experience data that the least possible adjustment must be made in comparing one another's figures.

The excellent and impartial work done by the "Differential Committee" of the Workmen's Compensation Service Bureau along the line of state differentials is very valuable and useful. After we have sufficient American data, however, so that it can be used to the exclusion of foreign data, the work of this committee might be revised and a purely American basis used, *provided* that American data is so kept that its value is not lost through errors consequent upon too much readjustment.

Much that may be said in regard to the need of proper statistics for comparative purposes is pertinent to the question of changes in each individual state law. It is imperative that the workmen's compensation statistics of any given state be available in such form that the cost of changes in the law may be closely estimated therefrom. If the waiting period is cut down or the maximum weekly indemnity raised, or any other change made, the correct determination of the added cost of such change depends upon the availability and reliability of the accident statistics.

I have little doubt but that industrial accident boards and others who are in a position to contribute data of the greatest value would willingly present that data in accordance with any reasonable demand therefor. At present, however, I have never seen what may be called the "A, B, C of Compensation Statistics," that is a clear, concise statement of what is really needed by those most interested.

Isn't this the answer to Dr. I. M. Rubinow, who maintained in an address before the first meeting of the Casualty Actuarial and Statistical Society of America (*Proceedings Casualty Actuarial and Statistical Society of America,* Vol. I, No. 1) that a careful analysis of the reports of the industrial accident boards of various states failed to disclose the statistical data so much desired in the casualty business?

Dr. Rubinow says: "Each of these reports is interesting and to some extent valuable, but an effort to bring them together produces a maze of dis-similar data, absolutely barren of any tangible actuarial results."

Isn't the first step towards securing uniformity of results a proper setting forth of precisely what is wanted backed by the endorsement of such bodies as this and by leading actuarial organizations?

No one person, it seems to me, should assume that he is alone competent to promulgate such a series of workmen's compensation tables. The combined ideas of many who have had practical experience in handling workmen's compensation data should be utilized to develop standard tables, and here again comes in the text-book idea, once such tables are adopted so that they may be freely distributed.

I have always found, however, that when a certain matter is under discussion, that better progress is made when something tangible is actually in hand, as a basis for argument. This is my feeling in presenting these tables for your consideration. They are not offered as the embodiment of all that ought to be adopted, but as a basis for building something better, and if the time should come when a uniform system of statistics is actually adopted, any small contribution to that end may be modestly regarded as a service in a good cause, the success of which depends absolutely on the cordial and earnest cooperation of all those to whom the privilege and duty has been entrusted.

EXHIBIT A.

SAMPLE PAGE

OF

TENTATIVE UNIFORM TABLE OF CLASSIFICATION OF INDUSTRIES.
Manufactures (2000).

3200 Chemicals and Allied Products.

		Basis Manual Number.	Symbol.
3210	*Acids and Chemicals:*		
3211	Acid Mfg. (n.o.c.)	4510	LC
3212	Analytical Chemists, including shop work and work performed away from shop	4511	LC
3213	Sulphur Mfg.	4512	LC
3214	Vitriol Mfg.	4513	LC
3221	Alcohol and Acetic Acid Mfg.	4520	KW
3222	Ammonia Mfg.	4521	KW
3223	Arsenic Mfg.	4531	KW
3224	Tartaric Acid Mfg.	4522	KW
3225	Disinfectant Mfg.	4523	KW
3226	Chemical Mfg. (n.o.c.)	4524	KW
3227	Saltpetre Mfg.	4525	KP
3228	Wood Preservative Mfg.	4526	KP
3229	Bleaching Powder Mfg.	4527	KP
3230	Creosote Mfg.	4528	KP
3231	Borax Mfg.	4529	KP
3241	Camphor Mfg.	4530	CA
3250	*Baking Powder and Yeast:*		
3251	Baking Powder Mfg.	4500	BL
3252	Yeast Mfg.	4501	BL
3253	Soda Bicarbonate Mfg.	4502	BL

EXHIBIT B.

SAMPLE PAGE

OF

TENTATIVE UNIFORM TABLE OF CAUSES OF INJURY.

II. *Explosives, Electricity, Fires, Heat and Corrosive Substances.*

Industry.	C. Explosives—Gas.			
	Death.	Permanent Total Disability.	Permanent Partial Disability.	Temporary.
2000 Manufactures				
3200 Chemicals and Allied Products				
3210 Acids and Chemicals				
3250 Baking Powder and Yeast				
3260 Paints, Colors and Dyes				
3270 Drugs and Medicines				
3280 Soap and Tallow				
3290 Starch				

EXHIBIT C.

TENTATIVE UNIFORM TABLES FOR THE ESTABLISHMENT OF WORKMEN'S COMPENSATION COSTS.

Definition of an Accident as Used in These Tables.—"A tabulatable accident is one which occasions loss of time on any day on which the injured would have worked other than the day of the accident."

Table I. Class of Benefit.

The number of accidents by character and extent of injury.

Accidents Resulting in:	Number of Accidents.
(*a*) Death	
With dependents	
No dependents	
(*b*) Specified injuries (dismemberments)	
(*c*) Permanent total disability	
(*d*) Permanent partial disability	
(*e*) Temporary disability	
(*f*) Medical and hospital services only	
(*g*) Total number of tabulatable accidents	
(*h*) Minor accidents reported not tabulatable	

Table II. Wages of Injured Employees.

(a) Fatal.	Amount of Wages.	(b) Non Fatal.
	Under $4	
	$4 and under 5	
	5 and under 6	
	6 and under 7	
	7 and under 8	
	8 and under 9	
	9 and under 10	
	10 and under 11	
	11 and under 12	
	12 and under 13	
	13 and under 14	
	14 and under 15	
	15 and under 16	
	16 and under 17	
	17 and under 18	
	18 and under 19	
	19 and under 20	
	20 and over	

Table III. Dependents in Fatal Cases.

Extent of Dependency.	Number of Cases.	
	Native.	Alien.
Surviving wife		
Dependent husband		
Surviving wife and 1 minor child		
Surviving wife and 2 minor children		
Surviving wife and 3 minor children		
Surviving wife and 4 minor children		
Surviving wife and over 4 minor children		
Dependent husband and 1 minor child		
Dependent husband and 2 minor children		
Dependent husband and 3 minor children		
Dependent husband and 4 minor children		
Dependent husband and over 4 minor children		
1 minor child		
2 minor children		
3 minor children		
4 minor children		
Over 4 minor children		
Other total dependents		
Partial dependents		
To the extent of 10%		
11 to 20%		
21 to 30%		
31 to 40%		
41 to 50%		
51 to 60%		
61 to 70%		
71 to 80%		
81 to 90%		
91 and over		
No dependents		

Table IV. Age of Dependents in Fatal Cases.

Age.	Native.			Alien.		
	Widow.	Husband.	Other.	Widow.	Husband.	Other.
Under 19						
20 to 24						
25 to 29						
30 to 34						
35 to 39						
40 to 44						
45 to 49						
50 to 54						
55 to 59						
60 to 64						
65 and over						

Table V. Age of Minor Child in Fatal Cases.

Age.	Native.	Alien.
Under 5		
5 to 9		
10 to 12		
13 to 15		
16 to 18		
19 to 21		

Table VI. Period of Incapacity.

Duration.	Temp. Total Disability Preceding Permanent Partial Disability.	Temp. Total Disability Preceding Death.	Other Temporary Total Disability.	Partial Disability.
1 day and under 4 days.....				
4 days and under 7 days.....				
7 days and under 10 days.....				
10 days and under 14 days.....				
14 days and under 21 days.....				
21 days and under 28 days.....				
4 weeks and under 5 weeks....				
5 weeks and under 6 weeks....				
6 weeks and under 7 weeks....				
7 weeks and under 8 weeks....				
8 weeks and under 9 weeks....				
9 weeks and under 10 weeks....				
10 weeks and under 11 weeks....				
11 weeks and under 12 weeks....				
12 weeks and under 13 weeks....				
13 weeks and under 25 weeks....				
25 weeks and under 50 weeks....				
50 weeks and under 100 weeks....				
100 weeks and under 150 weeks....				
150 weeks and under 200 weeks....				
200 weeks and under 250 weeks....				
250 weeks and under 300 weeks....				
300 weeks and under 350 weeks....				
350 weeks and under 400 weeks....				
400 weeks and under 450 weeks....				
450 weeks and under 500 weeks....				

Table VII. Age and Sex of Injured Employees.

Age.	Death.	Permanent Total Disability.	Permanent Partial Disability.	All Other.
Under 14 male				
female				
14 and under 19 male				
female				
20 and under 24 male				
female				
25 and under 29 male				
female				
30 and under 34 male				
female				
35 and under 39 male				
female				
40 and under 44 male				
female				
45 and under 49 male				
female				
50 and under 54 male				
female				
55 and under 59 male				
female				
60 and under 64 male				
female				
65 and over				

Table VIII. Permanent Partial Disability or Impairment in Wages.

Amount of Impairment.	No. of Cases.
Less than $1	
$1 and under 2	
2 and under 3	
3 and under 4	
4 and under 5	
5 and under 6	
6 and under 7	
7 and under 8	
8 and under 9	
9 and under 10	
10 and over	

Table IX. Per cent. of Disability.

Per Cent. of Disability to Total Disability.	No. of Cases.
Up to 10% Disability	
11% to 20% Disability	
21% to 30% Disability	
31% to 40% Disability	
41% to 50% Disability	
51% to 60% Disability	
61% to 70% Disability	
71% to 80% Disability	
81% to 90% Disability	
(over 90% constitutes total Disability)	

Table X. Specific Injury or Dismemberment Cases.

This represents a summary table according to the needs of the individual state, and may be made up from the detailed classification of Nature of Injuries.

Nature.	No. of Cases.
Loss of both arms	
Loss of both hands	
Loss of both legs	
Loss of both feet	
Loss of one arm and one leg	
Loss of one hand and one foot	
Loss of major hand	
Loss of minor hand	
Loss of either foot	
Loss of both eyes	
Loss of either eye	
Loss of two or more fingers	
Loss of two or more toes	
Loss of phalange	
Cases of disfigurement	

Table XI. Cost of Medical and Hospital Services.

	Death.	Specified Injuries.	Permanent Total Disability.	Permanent Partial Disability.	Temp. Disability.	Medical Hospital Services Only.
Medical services						
Hospital services						
Nurses						
Ambulance						
Surgical appliances						