THE IMPACT OF TRAFFIC ACCIDENTS ON WAR INDUSTRY

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SYNOPSIS

Average absences from the job following traffic accidents were found to be: non-injured driver—$\frac{3}{4}$ day; injured driver—14 days; injured passenger—27 days and injured pedestrian—52 days. These were calculated on the basis of mail questionnaire surveys in three cities and two states carried on by the National Conservation Bureau in cooperation with local traffic agencies. These losses are the direct absences from work and do not include the many indirect man-hour losses.

Rural accidents were found to result in greater hour losses than urban accidents. Injured passengers consistently reported greater time losses than injured drivers, leading to the conclusion that passengers generally are more severely injured than drivers.

According to the National Safety Council, work accidents caused 270 million man-days loss in 1943 as compared to 19 million man-days lost by workers due to off-the-job accidents. Though this proportion may seem to make off-the-job traffic accident losses appear relatively unimportant compared to work accidents, the actual magnitude of loss is a serious detriment to the Nation's war effeort, and should not be overlooked. The amount of effort on the part of Industry directed against off-the-job traffic accidents has been extremely small.

It is estimated that during 1944, 130,000 cars were scrapped due to traffic accidents, and that total automobile damage approximated 300 million dollars. The studies showed that 38 per cent of cars involved in fatal accidents to occupants were scrapped, 15 per cent involved in occupant injury accidents were scrapped, and 2 per cent of those in property damage accidents were scrapped. This is a serious loss in the face of the present National emergency.

Delays in obtaining automobile repairs not only discommode car owners but cause job man-hour losses, as reported by many war workers. The percentage experiencing delay ranged from 21 for repairs under $25 to 83 for repairs over $100, with an overall average of a little over 50 per cent.

During 1944 approximately 13,000 U. S. workers were killed, 40,000 permanently disabled, and 400,000 temporarily disabled due to injuries received in traffic accidents. In addition, approximately 4 million property damage (no injuries involved) collisions occurred. About 7 million automobiles were involved in all types of accidents.

The two most serious effects of these accidents upon war industry were, (1) the production man-hours lost, and (2) the damage inflicted upon the Nation's irreplaceable fleet of automobiles, which carry 60 to 70 per cent of all workers to and from their jobs.

Measuring the impact of traffic accidents upon war industry in terms of these two elements, the following nationwide losses for 1944 are estimated, based upon extensive areawide studies of five cities and two states.

Nationwide Losses

20 million man-days loss from all jobs due to employee absences.
300 million dollars automobile damage.
130,000 automobiles scrapped.

Average Losses per Person

Average injured pedestrian, 52 days absent.
Average injured passenger, 27 days absent.
Average injured driver, 14 days absent.
Average non-injured driver, $\frac{3}{4}$ day absent.
Persons involved in rural accidents lost more time on the average than those in urban accidents.

Average Damage Per Car

Average damage per car in fatal accident, $356

Average damage per car in car occupant injury accident, $210
Average damage per car in pedestrian injury accident, $8
Average damage per car in non-injury accident, $95[1]
Rural accidents produced greater average damage than urban accidents.

Automobile Scrappage

38 per cent of cars in car occupant fatal accidents were scrapped.
15 per cent of cars in car occupant injury accidents were scrapped.
2.4 per cent of cars in property damage only accidents were scrapped.
Scrappage in pedestrian injury accidents was negligible.

These data which are later discussed in detail were derived from studies made by the National Conservation Bureau in cooperation with local traffic safety authorities in Schenectady, N. Y.; Providence, R. I.; Omaha, Neb.; Lansing, Mich.; Wilmington, Del.; Delaware and Connecticut (statewide), and are based on 1,316 usable replies to questionnaires which were sent to 5,000 drivers, passengers, and pedestrians involved in traffic accidents during 1944. In each city and state, the total losses for the year preceding the study were estimated, based upon the local accident data and loss ratios as revealed by the questionnaire studies, and detailed reports rendered to the local traffic safety authorities.

DISCUSSION OF NATIONWIDE LOSSES

The 20 million man-days loss for 1944 represents direct absences from the job, since accident victims were asked only how many days' or hours' absence from work resulted from the accident. This total represents both on and off-the-job motor vehicle accidents. Deaths are not included.

In order to arrive at this grand total, it was necessary first to calculate "accident impact ratios," or man-days loss per traffic accident, by types of accidents. These ratios were derived as follows:

Following through the calculation for urban property damage accidents; first the average number of drivers per accident (see Table 1) was found by a study of the accident records in each of the cities and states named previously. This was found to be 1.9 drivers per urban per day accident. Then, knowing the percentage of urban drivers who are employed (see Table 2), 87 per cent, it is evident that only 1.65 drivers per accident lose time from work (0.87 × 1.9 = 1.65). Multiplying this figure of 1.65 employed drivers by the reported time loss per urban driver, 0.55 days (see Table 7) gives 0.91 man-days loss per urban property damage accident.

TABLE 1
PERSONS PER ACCIDENT
Based on 3,064 Accidents

Type of Accident	Average Number of: Drivers not Injured DN	Passengers not Injured XN	Drivers Injured DI	Passengers Injured XI	Pedestrians Injured PI
Urban					
Property Damage Only..	1.90	1.80	0	0	0
Car Occupant Injured or Killed	1.20	0.95	0.56	0.84	0
Pedestrian Injured or Killed	1.00	1.08	0	0	1.02
Rural					
Property Damage Only..	1.60	1.96	0	0	0
Car Occupant Injured or Killed...........	0.98	1.75	0.62	0.94	0
Pedestrian Injured or Killed	1.10	1.20	0	0	1.04

TABLE 2
PER CENT OF ACCIDENT PARTICIPANTS EMPLOYED
Based on 2048 rural and 2414 urban accident victims' occupations

	Drivers	Passengers	Pedestrians
Urban accidents............	87	75	46
Rural accidents.............	93	77	48

Table 3 shows the calculation of accident impact ratios. These were multiplied by the corresponding 1944 Nationwide accident totals (estimated as of Feb. 1, 1945) to obtain U. S. losses shown in Table 4 and Figure 1.

Table 4 also shows impact ratios for estimated damage to automobiles, these ratios being calculated on the basis of average number of cars per accident (same as number of drivers) and average reported damage per car.

In Table 2, employment refers to any kind

[1] Reported accidents where compulsory to report damage only over $25.

of regular employment. Housewives, students, retired persons, army and navy personnel and children are not included in this naires. For instance, whereas 87 per cent of drivers were regularly employed, only 70 per cent of all drivers were war plant employees.

TABLE 3

CALCULATION OF ACCIDENT IMPACT RATIOS—MAN-DAYS LOSS, AUTOMOBILE DAMAGE AND AUTOMOBILES SCRAPPED PER ACCIDENT

Type of Accident	Drivers Not Injured			Drivers Injured			Passengers Injured			Pedestrians Injured			Impact Ratios		
	No.[a]	Days Loss Ea.	Total Loss	No.[a]	Days Loss Ea.	Total Loss	No.[a]	Days Loss Ea.	Total Loss	No.[a]	Days Loss Ea.	Total Loss	Man-days Loss	Car Dam. $	Cars Scrapped
Urban															
Property Damage Only...	1.65	0.55	0.91										0.9	130	0.032
Occupant Injured...	1.05	0.55	0.58	0.49	13.5	6.61	0.63	23.4	14.7				21.9	320	0.170
Occupant Killed...	0.44	0.55	0.24	0.35	13.5	4.72	0.23	23.4	5.38				10.3	500	0.58
Pedestrian Injured..	0.87	0.55	0.48							0.47	52.0	24.4	24.9	7	0
Pedestrian Killed...	0.87	0.55	0.48										0.5	7	0
Rural															
Property Damage Only...	1.50	1.17	1.75										1.8	190	0.077
Occupant Injured....	0.91	1.17	1.06	0.58	15.2	8.82	0.72	37.1	26.7				36.6	390	0.370
Occupant Killed	0.47	1.17	0.55	0.37	15.2	5.62	0.23	37.1	8.5				14.7	775	0.64
Pedestrian Injured...	1.02	1.17	1.19							0.50	53.4	26.7	27.8	10	0
Pedestrian Killed.....	1.02	1.17	1.20										1.2	10	0

[a] Total employed persons per accident.

TABLE 4

TOTAL U. S. 1944 IMPACT ON WAR INDUSTRY—MAN-DAYS LOSS FROM EMPLOYMENT PLUS AUTOMOBILE DAMAGE

Type of Accident	Number of Accidents[a]	Impact Ratio Man-days	Total Loss, Man-days	Impact Ratio $ Damage	Total $ Damage	Impact Ratio Scrap-page	Total Scrap-page
Urban Property Damage Under $25.........	2,400,000	0.9	2,160,000	10[b]	24,000,000	0	0
Rural Property Damage Under $25	500,000	1.8	900,000	15[b]	7,500,000	0	0
Sub-Total	2,900,000		3,060,000		31,500,000		0
Urban Property Damage Over $25..........	675,000	0.9	607,500	130	88,000,000	0.032	21,600
Rural Property Damage Over $25......	225,000	1.8	405,000	190	42,700,000	0.077	17,300
Sub-Total........................	900,000		1,012,500		130,700,000		38,900
Urban Car Occupant Injury	200,000	21.9	4,380,000	320	64,000,000	0.170	34,000
Rural Car Occupant Injury	130,000	36.6	4,750,000	390	51,000,000	0.370	48,000
Sub-Total..............................	330,000		9,130,000		115,000,000		82,000
Urban Car Occupant Killed...............	3,300	10.3	34,000	500	1,650,000	0.58	1,900
Rural Car Occupant Killed.............	8,900	14.7	131,000	775	6,900,000	0.64	5,700
Sub-Total...............................	12,200		165,000		8,550,000		7,600
Urban Pedestrian Injured.................	200,000	24.9	4,980,000	7	1,400,000	0	0
Rural Pedestrian Injured.................	20,000	27.8	556,000	10	200,000	0	0
Sub-Total...............................	220,000		5,536,000		1,600,000	0	0
Urban Pedestrian Killed..................	6,400	0.5	3,200	7	44,800	0	0
Rural Pedestrian Killed..................	3,200	1.2	3,840	10	32,000	0	0
Sub-Total	9,600		7,040		76,800	0	0
Grand Total (rounded off)			20,000,000		300,000,000		130,000

[a] Preliminary 1944 estimates Feb. 1, 1945.
[b] Estimated.

classification. In each of the cities and States studied, the percentages corresponding to war plant employment only are found, as reported by the accident participants on the questionnaires. However, the actual percentages in war plants vary considerably from city to city, whereas the percentage employed (regardless of type of work) was found to vary less, hence for purposes of estimating nationwide total losses, the latter percentages are used. The resulting impact ratios denote lost man-days for all employment. Since almost everyone's job today helps the war effort in one way or another, these impact ratios represent loss to war production due to direct absence from all jobs. Indirect man-days losses, as pointed out later, may be even greater than the direct losses which the impact ratios denote.

The impact ratios in Table 3 could be used to estimate the areawide job man-days losses in cities or states by multiplying each ratio by

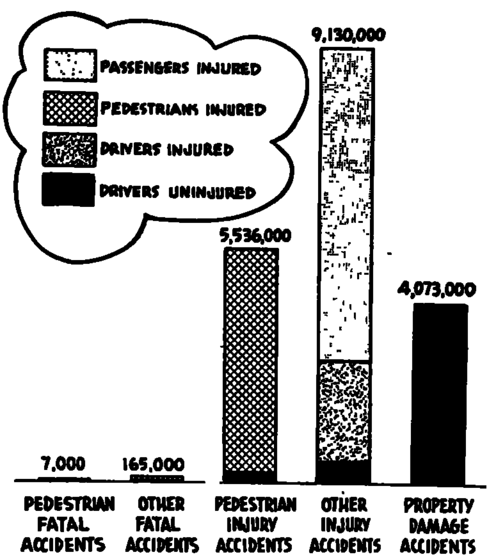

Figure 1. Direct Man-days Loss, United States—1944. Due to all M.V. Traffic Accidents.

the corresponding accident total, as was done for the nation in Table 4.

Figure 1 shows the overall U. S. total man-days losses by accident classification and also by person involved. Uninjured passengers, though they are known to lose time, are not included as data on this type of loss were secured only in one community studied which is not considered enough on which to base any nationwide estimate.

The breakdown of losses (Fig. 1) is given in Table 5.

In terms of losses per person, we find the following total 1944 losses:

Passengers Injured....... 6,503,600 man-days
Pedestrians Injured...... 5,416,000 man-days
Drivers Uninjured........ 4,455,700 man-days
Drivers Injured.......... 2,535,700 man-days

Attention is directed to the fact that the uninjured drivers' total occupies third place, aggregating more lost time than the injured drivers total. Naturally this comes about because of the great number of property damage accidents, but it serves to illustrate the importance of even the most minor accidents in considering the losses to industry.

DISCUSSION OF AVERAGE LOSSES PER PERSON

Man-hours loss from industry following a traffic accident may be classified under the following major headings:

TABLE 5

	Man-Days Losses	
	Total	Sub-Totals
Property Damage Accidents	4,073,000	
Drivers Uninjured.		4,073,000
Car Occupant (other) Injury Accidents	9,130,000	
Drivers Uninjured.....		250,000
Drivers Injured		2,470,000
Passengers Injured...... ...		6,410,000
Pedestrian Injury Accidents	5,536,000	
Drivers Uninjured		120,000
Pedestrians Injured		5,416,000
Car Occupant (other) Fatal Accidents	165,000	
Drivers Uninjured....		5,700
Drivers Injured.		65,700
Passengers Injured		93,600
Pedestrian Fatal Accidents	7,000	
Drivers Uninjured		7,000

1. *Temporary Absence.* This is the direct job time loss of the employee following his traffic accident. The average losses shown and discussed in this paper are of this type. Usual causes are: hospitalization or confinement to home due to injury or shock, taking care of getting car repaired, appearance at police station or in court, and other causes which will be discussed more fully further on.

2. *Permanent Absence.* To industry as a whole, the death or permanent disabling of a worker results in a permanent loss. From the standpoint of an individual employer, a permanent absence results also when an employee changes his job as a result of a traffic accident. In the reports obtained from accident participants in the studies previously described there

were a number of employees who indicated that they had changed jobs because of the accident.

When a person quits his job or is fatally injured in a traffic accident, it usually takes some time to replace him; meanwhile there is nobody doing his work. Where an accident victim doesn't die immediately, but lingers in the hospital for days or months before succumbing to his injuries, even greater than the normal amount of time may expire before his job is filled again. The National Safety Council's estimate of average loss in this category is 150 man-days per fatality. This is only the work-time lost during the current year. There is still a long time loss that stems from the fact that the worker is lost permanently, or practically, for about 20 years. This secondary effect or long time loss is discussed under Item 6.

3. *Supervisor's Extra Work.* Naturally there is extra supervisory work necessary when a worker is off the job temporarily or permanently. This may arise because of necessity for checking upon causes for absence, making arrangements to aid the accident victim, extra paper work and book-keeping, interviewing applicants to replace the absent worker, temporarily or permanently, and training the new worker. In order to do this extra work, the supervisor must turn away from the regular war work at hand, thus causing the same time loss to war production as though he were absent.

4. *Inefficient Work of Victim.* In many cases the accident victim returns to work before he is completely recovered from the effects of the accident. Thus his work suffers through nervousness and/or physical disability. Then, of course, there are many workers who keep right on working after an accident despite their injuries or nervous shock, which means that their work is less efficient than normal. The result is a loss in production or effective man-hours.

The National Safety Council estimates that the average of efficiency is reduced 10 per cent during the remainder of the year that a person works upon returning to work after being laid up with an injury.

5. *Other Employees.* Another indirect loss involves other employees who were not in the accident but who take time off to discuss the accident to sympathize with the victim or for other reasons relating to the accident. For instance, one man in Connecticut was absent 6 days from his job in a war plant to be near his wife and daughter in a hospital in another city where they were forced to stay because of traffic accident injuries. In other words, besides 54 days the woman lost from her job, her husband (who wasn't in an accident at all) also lost 6 days.

Under this heading also would fall the time loss of mechanics, doctors, druggists, etc., who are forced to turn away from more important war work to attend to rehabilitating the accident victim and his automobile.

6. *Past Years' Accumulated Loss.* Traffic accidents in one year have an effect on industrial production in subsequent years. A skilled worker who was killed or permanently disabled five years ago means one less worker this year, and where there is a shortage of skilled labor, as there has been during this war period, this means a real loss in war production.

Most authorities agree that accidental deaths of skilled workers back as far as 1936, 1935, or 1934, are a factor in determining the total economic capacity of this country today. In fact, industry has adopted the view that the average period to be used should be 20 years. That is, that the standard time charge for a fatality, used in evaluating the economic loss of accidents, should be 6,000 man-days, or 20 working years—about the average accident victim's working future that is cut off when he is killed.

Thus the time charge totals for deaths during one year should reflect the accumulation of lost manpower due to fatal accidents of the last 20 years.

Frequency Distribution of Average Losses

Individual reports of time losses (temporary absence) obtained by the National Conservation Bureau studies ranged all the way from zero to as high as 182 working days.

It must be pointed out that the average time losses per person are by no means the most likely or probable losses to occur to an individual. In fact, the mode of the distribution of losses is at zero, or a greater percentage of reports fell in the zero loss classification than in any 10 hour bracket (when arranging distribution by per cent of cases at 0, 1 to 10, 11 to 20, etc.). An employee involved in a traffic accident is most likely to lose no time. However there are enough employees who lose days, weeks and months of work to bring the average losses up to the values shown in Table 6.

TABLE 6
PROOF OF SIGNIFICANCE OF DIFFERENCE BETWEEN PASSENGER & DRIVER LOSSES

Location of Study	Hours Lost by the Average Injured		Difference in Hours Lost	Difference Squared
	Passenger	Driver	Pass. minus Driver	
Providence	258	154	104	10,820
Schenectady	167	30	137	18,720
Omaha	206	127	79	6,250
Conn. Urban	200	96	104	10,820
Conn. Rural	368	134	234	55,000
Delaware Rural	136	98	38	1,440
Total	1,335	639	696	103,050
Average	222.5	106.5	116	17,175

N = groups = 6.
σD = Standard deviation of differences = $\sqrt{17{,}175 - (116)^2}$ = 61.0.
N = degrees of freedom = $N - 1 = 5$.
Ma = Standard error of mean difference = $\frac{D}{N-1} = 27.3$.
$t = \frac{116}{27.3} = 4.25$ (calculated).
$t = 4.03$ (99 out of 100).

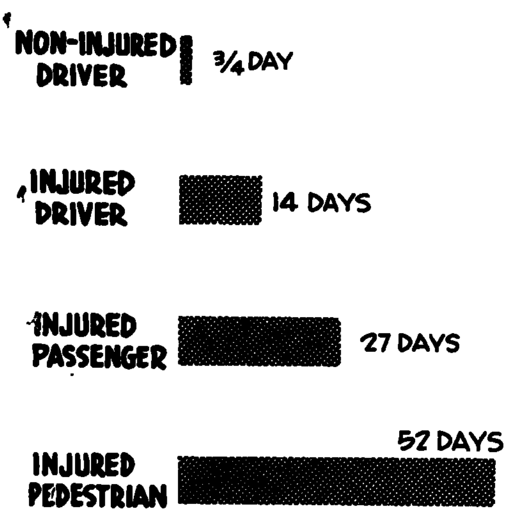

Figure 2. Average Time Loss from the Job Per Person Due to a Traffic Accident.

Of pedestrian injury accidents, 92 per cent resulted in lost time; of passenger injuries, 81 per cent were lost time accidents; 72 per cent of injured drivers lost time; and 26 per cent of drivers not injured but involved in accidents lost time from work.

The distribution of reported losses obtained by pooling reports from the cities and States studied by the National Conservation Bureau is shown in Figure 4.

It is apparent that absences do not follow a "normal" distribution, nor does the distribution have a straight line relationship between length of absence and frequency of occurrence. Instead, the relationship is a "J" curve. It was found that by plotting both time losses and frequency of occurrence on logarithmic scales a straight line relationship appeared, as shown in Figure 5. This would indicate that these data approach a relationship as follows:

log (frequency of occurrence of absence of a

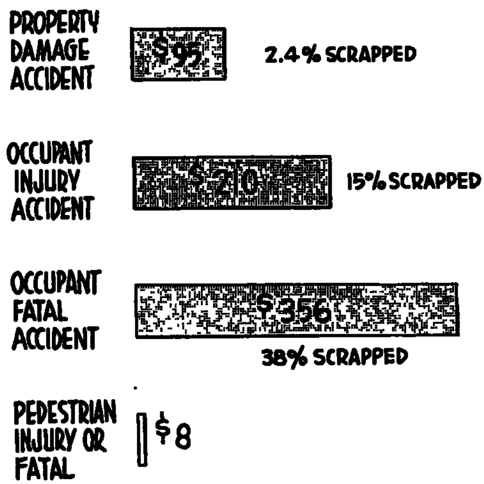

Figure 3. Average Automobile Damage Per Automobile Due to a Traffic Accident.

particular duration) = log A + B log (length of that particular absence)

or more simply, $\log Y = \log A + B \log X$ or $Y = A X^B$

where A and B are constants; X, duration of absence; and Y, the number of occurrences of absences of X value.

Since the slope of the line of regression or B would be negative, the equation more properly might be written $Y = \frac{A}{X^B}$.

I suspect that the length of absence from the job is not in linear proportion to the severity of personal injury. There is undoubtedly a range of injury severities included in the zero hours loss bracket. The type of work and psychological makeup of the injured person would be factors that would largely determine whether a person returns to work or not following an accident. For instance, where the victim's leg was broken, let us say, a desk worker might lose only several days, while a truck driver or laborer would probably be absent until the leg was fully mended. Certainly the fact that 28 per cent of injured drivers, 19 per cent of injured passengers and 8 per cent of injured pedestrians lost no time whatsoever from their jobs indicates that many people return to work immediately despite injury. Since the zero point on the hours loss scale does not indicate zero injury, but may include injuries of a wide range of severity, the relationship of severity of injury to frequency of occurrence would not necessarily follow the type of curve shown in Figure 4. It is possible and I think probable that a normal type distribution would be found, skewed to the right.

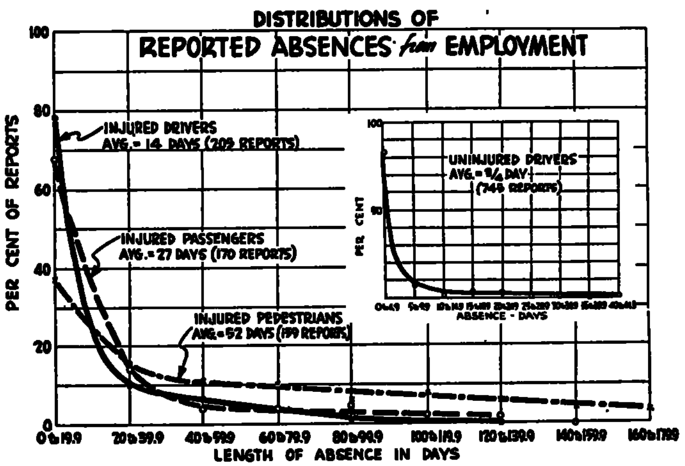

Figure 4

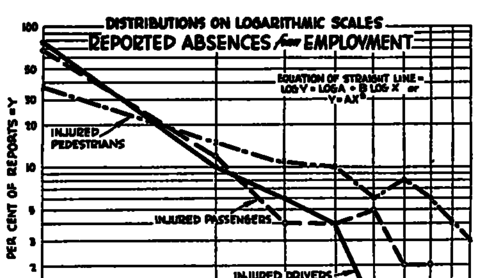

Figure 5

Passenger vs. Driver Losses

It is evident that pedestrian losses ran higher than passenger losses, which in turn ran higher than driver losses (considering injured persons). It seems logical that the pedestrian should suffer greater injury than car occupants and hence lose more hours from work. Also it is logical to visualize how the passenger might be exposed to greater danger than the driver. Probably the most significant reason for this is the fact that the driver has the steering wheel to support him whereas the passenger has nothing to prevent his being thrown violently against the inside of the car when a collison occurs. There may be other reasons too, such as the forewarning the driver often receives of an impending collision an instant before it occurs, which the passenger may not foresee since he does not watch the road ahead as constantly as does the driver.

An investigation was made of the difference in hours loss between injured drivers and passengers to test the significance of the observed difference. As shown in Table 6, an analysis of the paired differences (using the method described by Pearson and Bennett in Statistical Methods Applied to Agricultural Economics, page 337) indicates that the difference between the average man-days loss of passengers and drivers is significant, and not due to chance.

Conclusion: Difference between passenger hours loss and driver hours loss is very significant. Therefore I believe this is proof that passengers are generally injured more severely than drivers. Even if injury severity isn't linearly, proportional to time losses as brought out in the previous section, yet it is logical that whatever the relationship between them greater time losses would denote more severe injury.

Uninjured Passengers

The estimates in this study embrace direct absences of all persons directly involved in traffic accidents except the non-injured passenger. It is recognized that additional losses accrue to industry through their losses too.

TABLE 7
AVERAGE NUMBER OF DAYS LOST FROM WORK BY EACH

Location of Accident	Uninjured Driver	Injured Driver	Injured Passenger	Injured Pedestrian
Urban	0.55	13.5	23.4	52.0
Rural	1.17	15.2	37.1	53.4
Combined	0.75	14	27.0	52.0

In Delaware it was found that uninjured passengers' reports averaged 5.3 hours loss from the job. Reasons given were loss of transportation and necessity for appearing in court and at police headquarters. Since no reports were secured in this category in the other areas studied, no general average was calculated for estimating Nationwide losses.

Urban vs. Rural Losses

As would be expected, urban losses were lower than rural losses. In Table 7 is shown the classification of reported losses by location of accident, urban and rural.

The rural man-days losses were obtained from reports of persons in Delaware and Connecticut, both relatively small States. Probably urban and rural traffic characteristics are more nearly alike in these states than in most other States with a greater proportion of rural area. It would seem likely that there would be a greater difference between urban and rural traffic characteristics in Michigan or Texas than one would find in Delaware or Connecticut, and that the differences between accident severity in urban vs. rural accidents would therefore be even more strongly pronounced in other larger states.

The fact that our study showed rural accidents to be causing longer absences from work than urban accidents is due to these major reasons I believe:

(1) Rural speeds are higher, hence injuries more severe.
(2) There is a likelihood of reporting a greater portion of the minor accidents in urban areas than in rural areas, hence accident reports for rural accidents may contain only the more serious accidents.
(3) There is more difficulty in attending to moving a disabled car from a rural location to a garage, causing additional hours of absence by the occupants and car owner.

Possible Biasing of Reported Losses

Early in the planning stage of the mail questionnaire studies by which the reports forming the basis of the data shown in this paper were secured, it was recognized that there might be a tendency for only the more severely injured war workers to fill out and return the questionnaire. The accident participant who was involved in a minor accident might consider it unimportant and therefore neglect to answer the questionnaire. To forestall this possibility a short letter of explanation on the letterhead of the local traffic safety authority accompanied each questionnaire blank, pointing out the importance of obtaining reports on all accidents, including those where no time was lost from work or where no automobile damage was suffered. In the Connecticut study the questionnaire form was given an official status by printing it on the official State Motor Vehicle Department accident report form letterhead and the accident participant was instructed to complete the form as additional required information for the M. V. Department records.

Because of these precautions it is believed that any actual biasing was not significant. Also lending support to this statement is the fact that so many returns were received where the person reported no lost time and no automobile damage. For instance, 74 per cent of all uninjured drivers reports showed no lost time. 28 per cent of the injured drivers, 19 per cent of injured passengers, and 8 per cent of injured pedestrians reported no lost time. Similarly a large proportion of automobile damage reports were of zero damage as brought out in *the Discussion of Average Damage per Car*, lending further support to the belief that biasing was not significant.

Reasons for Time Losses

In the case of injured passengers and pedestrians, the absence from work following involvement in a traffic accident is due almost entirely to injuries sustained. The studies revealed that relatively a small amount of time is taken up in consulting lawyers, filling out accident forms, appearing at police headquarters or at hearings, etc.

TABLE 8
PER CENT OF CAR OWNERS SEEKING CAR REPAIRS WHO ENCOUNTERED DELAY (1944)

Delaware	66
Omaha, Neb.	60
Providence, R. I.	57
Schenectady, N. Y.	46
Connecticut	45
Lansing, Mich	42

TABLE 9
CAR OWNERS EXPERIENCING DELAYS IN OBTAINING CAR REPAIRS

Repair Bill	Per Cent Encountering Delay
0 to $25	20
$26 to $50	38
$51 to $100	68
$101 to $500	72
$501 and over	86

Occasionally a passenger will lose a day or more from work simply because his means of getting to and from work is no longer available —that is the passenger car is laid up for repairs.

In the case of the injured driver a lesser proportion of his absence is due to injuries and a greater portion related to automobile damage. Delays in obtaining repairs to the damaged automobile were responsible for part of the 1944 driver time losses. Table 8 shows the percentages of car owners who reported that they encountered delays in obtaining repairs.

As would be expected, the extent of delay encountered varied directly as the amount of damage to be repaired. In Table 9 are shown the percentages of car owners delayed according to an ascending scale of automobile damage. This table is based on 648 drivers' reports obtained in Connecticut, Delaware, Lansing, Omaha, Providence and Schenectady.

Reasons given for delays were about evenly divided between labor shortage and parts shortage. Other causes were insignificant in number reported.

Among the non-injured drivers, the business of taking care of car repairs constituted the major reason for job time loss. In Connecticut, 62 per cent; in Lansing, 66 per cent; and in Omaha, 80 per cent of the lost time of non-injured drivers was consumed in taking care of the arrangements for repairs or waiting while the car was being repaired. Because of inability to get to work any other way, many car owners and their regular passengers had to remain absent from the job while the automobile was laid up for repairs.

The non-injured drivers lost, on the average, 6 hours apiece (combined urban and rural), or ¾ day per driver. Naturally most drivers lost no time at all, taking care of repairs, etc., after working hours. But there were enough who did lose time to bring the average up to 6 hours. For instance, a turret lathe operator was involved in a property damage accident, where he wasn't hurt, but his car was laid up for repairs. He had been working overtime every day, driving his own car to and from work, before the accident. While his car was being repaired, he had to curtail his working schedule to a normal 8-hour day in order to find a ride back and forth with someone else, hence he lost 96 hours which he normally would have put in at overtime.

A supervisor of sub-assembly of time fuses reported that he could not get to work for 6 days because his car was in the repair shop, and he could not find any alternative means of transportation. A deckhand on an army transport boat lost 56 hours—a grinder and inspector lost 80 hours—a roofer lost 40 hours —more examples of car-owners forced to remain off the job because of no way to get to work while their cars were laid up for repair. Many uninjured drivers lost time while in court, some at the police station answering questions, and others just took off time because of nervousness following the accident.

DISCUSSION OF AVERAGE DAMAGE PER CAR

The following data are based on estimated damage of 3,558 cars involved in traffic accidents. Of these, 1800 estimates were reported by car owners via the mail questionnaires in the areas studied by the National Conservation Bureau. The remaining reports were taken directly from the accident records in these areas. These too are estimates made by the car owners except in a few cases where the investigating police made the estimates instead.

In Table 10 are listed the average car damage figures for different classes of accidents, separated into urban and rural accidents. In every case, the rural average is higher, for the same reasons as pointed out previously in comparing urban and rural man-days losses.

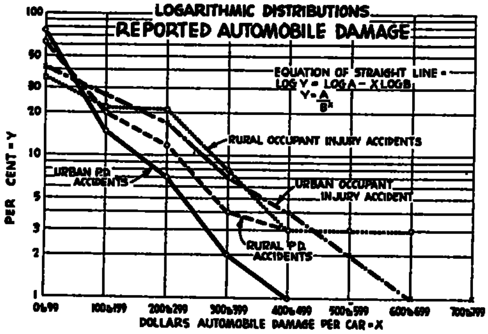

Figure 7

scale and damage (abscissa) on an arithmetic scale. This would indicate that the curve of distribution may be approximated by the formula $Y = \frac{A}{B^x}$ where y is the frequency of

TABLE 10
AVERAGE PROPERTY DAMAGE PER CAR

Type of Accident	Urban		Rural		Combined	
	No. of Cases	Avg. Damage $	No. of Cases	Avg. Damage $	No. of Cases	Avg. Damage $
Property damage only accidents	2046	70	145	120	2191	95
Car occupant injury accident	217	181	71	245	288	210
Car occupant fatal accident	66	330	73	517	797[a]	356
Pedestrian fatal or injury accident	846	7	94	9	940	8

[a] Includes additional cases not broken into urban and rural.

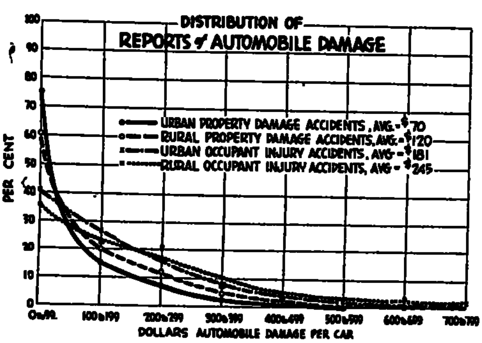

Figure 6

It was found that these damage figures formed a frequency distribution as shown on Figure 6 similar to that found for man-hours loss (Fig. 4). As shown on Figure 7, the relationship between damage severity and frequency becomes nearly linear when plotted with the (ordinate) frequency on a logarithmic

occurrence, A is a constant, B is a constant and X is the dollars damage.

Within the bracket of 0 to $100 damage the frequency distribution for property damage accidents followed exactly the pattern of the entire curve. For instance in the urban property damage accident group, 26 per cent fell within 0 to $10 damage group, 10 per cent in the $11 to $20 damage group, and so on. Investigation of personal injury accident data within the 0 to $100 bracket showed no tendency for the maximum number of cases to fall nearest the zero end of the automobile dollars damage scale, however there was no pronounced mode anywhere at all. Hence there is no reason to doubt that the distribution curves for both property damage accidents and car occupant injury accidents follow the same general pattern conforming to the equation shown.

There was a relatively large proportion of reports of no damage at all. Of property damage accidents, 13 per cent in the urban areas reported no damage and 8 per cent in the rural areas reported no damage. In personal injury accidents, 4 per cent of the urban cases and 4 per cent of the rural cases were zero damage. Since state law requires reporting of accidents involving personal injury, it is understandable that reports would be made on automobiles involved in P.I. accidents but not damaged. However in the property damage only classification, in only one of the areas studied are all accidents reportable. In one of the others the lower limit is $50, and in the remaining four areas only property damage accidents over $25 are required to be reported, hence how did the reports of these under $25 damage accidents get into the records? I think the answers are:

1. Voluntary reporting under the required $25 minimum.
2. Good work of local police in investigating minor accidents.
3. In some cases car owners simply reported repair costs, which were often less than the total damage done when the damage was not completely repaired.

TABLE 11
PER CENT OF CARS IN ACCIDENTS WHICH WERE SCRAPPED AS A RESULT

	Urban	Rural	Combined
Property Damage Accidents (Over $25)	1.7	5.0	2.4
Car Occupant Injury Accidents	10.0	23.0	14.7
Car Occupant Fatal Accidents	33.0	40.0	38.0
Pedestrian Accidents	0	0	0

DISCUSSION OF AUTOMOBILE SCRAPPAGE

The percentages of automobiles scrapped ran from 1.7 in urban property damage accidents to about 40 in rural fatal accidents. In Table 11 is shown the scrappage ratios found by the National Conservation Bureau studies.

The data indicate that 2 out of 5 cars involved in car occupant fatal accidents are scrapped, 1 out of every 7 in car occupant injury accidents is scrapped, and 1 out of 40 in property damage accidents (over $25) is scrapped.

The total number of automobiles scrapped because of traffic accidents during 1944 is estimated in round numbers at 130,000.

Since there were approximately 7,800,000 cars involved in accidents (see Table 12) during 1944, the figures indicate that about 1 car out of every 60 involved in all types of traffic accidents (including property damage accidents under $25) was scrapped as a result of the accident. The figure of 7,800,000 is the total of car-collisions and does not take into account repeaters. Hence the actual number of different cars involved in accidents was less than this—probably nearer 7 million.

The Office of Defense Transportation estimates that over a million automobiles were junked during 1944 for one reason or another. Thus there are about nine cars scrapped because of old age for every car that is scrapped because of a traffic accident.

It might seem rather unimportant that only one out of ten cars in the junk yard got there by accident. But remember that the one

TABLE 12
TOTAL CARS INVOLVED AND NUMBERS SCRAPPED

Total Accidents 1944	Cars per Accident (Table 1)	Total Cars Involved	Per cent Scrapped (Table 11)	Number of Cars Scrapped	Sub-Totals of Scrappage
675,000 Urban P.D. Acc. over $25	1.90	1,280,000	1.7	21,600	
225,000 Rural P.D. Acc. over $25	1.60	360,000	4.8	17,300	
Sub-Total		1,640,000			38,900
200,000 Urban Car Occ. Inj. Acc.	1.76	352,000	9.7	34,000	
130,000 Rural Car Occ. Inj. Acc.	1.60	208,000	23	48,000	
Sub-Total		560,000			82,000
3,300 Urban Car Occ. Fatal Acc.	1.76	5,700	33	1,900	
8,900 Rural Car Occ. Fatal Acc.	1.60	14,300	40	5,700	
Sub-Total		19,700			7,600
Grand Total		2,219,700[a]			128,500

[a] In addition there were 5,350,000 cars in p.d. accidents under $25 and 232,000 cars in pedestrian accidents in which scrappage was negligible.

accidentally destroyed car was, on the average, a relatively new car, while the other nine were old worn-out vehicles, junked because they were too old and unsafe to run any longer. In fact, cars being junked today are older and more decrepit on the average than ever before, because every effort is being made to keep every car running just as long as possible in the face of the unprecedented shortage of private transportation facilities.

The accidentally destroyed vehicle is representative of the average car on the street today. A check in our studies of the year models scrapped supports this statement showing the average age of the scrapped cars to be 8 years old, which is about the age of the average car in use today.

According to the Office of Defense Transportation, the scrappage during the three years preceding the war, 1939, 1940, and 1941, was 6 million vehicles. But during 1942, 1943, and 1944, the total vehicles scrapped was only 3½ million. This indicates a tightening up on scrappage. Thus, about 2½ million vehicles are operating on our streets and highways that ordinarily would have been scrapped if new cars were available for replacement. It is obvious that many of these cars "living on borrowed time" are old vehicles that should be junked, and are apt to be unsafe, which can only mean added chances for accidents during the next few years.

CONCLUSION

During this war period, the manpower losses to war production and the damaging and destroying of automobiles by traffic accidents represent a serious hindrance to our war effort. Much has been and is being done by Federal and National Organizations to reduce these losses. However very little has been done at the war plant level by the one person who has the most at stake, the employer, to combat traffic accidents, particularly off-the-job accidents.

Much remains that can and should be done by employers to combat traffic accidents. Each lost employee man-day means money out of the employer's pocket as well as a detriment to the war effort.

The economic losses to industry through motor vehicle traffic accidents definitely are becoming more important. We know that as automobile traffic volumes begin to come back to prewar levels, and accidents continue to rise, that this will mean an increasing economic loss to industry.

In the post-war era when war production is no longer a factor, these millions of man-days loss due to motor vehicle traffic accidents will mean monetary losses to industry which it cannot afford to overlook. There are many different costs paid by industry when a traffic accident occurs; unearned salaries paid accident victims, cost of training replacement workers, cost of overhead while the employee is laid up, and many others.

It will be 3 to 6 years or maybe even longer before the automobile manufacturers have satisfied the pent-up demand for cars, and the average age of the car on the street is back to the pre-war level of about 5 years. Today the average is about 8 years.

I can see two intervals in this 3 to 6 year period. During the first interval that is, the next couple of years—we will have an increasing number of old cars, which will certainly add to the existing hazards, especially as driving restrictions are eased.

The second interval will start with the manufacture and release of new cars in quantity on our streets and highways. During this second, more hazardous period, the new speedy cars will be mixing with the old jalopies left over from pre-war days—like those 2½ million that are now living on borrowed time. This can only lead to more accidents, because of the differentials in speed, and also because the owners of the old cars will try to keep up with the fast-moving new cars.

These factors mean only one thing to industry—more and more money paid out because of traffic accidents involving employees. The more that those in the traffic safety field can find out about the relation of traffic accidents to industrial losses, the more we can expect the cooperation of industry in helping to combat traffic accidents.