[12]

## TABLE 4
## HIGHWAY PATROL DWI ARRESTS AND CONVICTIONS

| YEAR | NUMBER ARRESTS | NUMBER CONVICTIONS | PERCENT CONVICTIONS |
|---|---|---|---|
| 1971 | 2,410 | 1,954 | 81.1 |
| 1970 | 1,860 | 1,510 | 81.2 |
| 1969 | 1,640 | 1,404 | 85.6 |
| 1968 | 1,535 | 1,342 | 87.4 |
| 1967 | 1,384 | 1,242 | 89.7 |
| 1966 | 1,225 | 1,164 | 95.0 |
| 1965 | 1,268 | 1,184 | 93.4 |
| 1964 | 1,270 | 1,211 | 95.4 |

## TABLE 5
## BLOOD ALCOHOL LEVELS IN DWI ARRESTS

| Alcohol Level (percent) | 1969 | 1970 | 1971 |
|---|---|---|---|
| Negative (.000-.009) | 137 | 151 | 166 |
| .010-.049 | 114 | 86 | 52 |
| .050-.099 | 178 | 176 | 229 |
| .100-.149 | 559 | 612 | 469 |
| .150-.199 | 1,154 | 1,343 | 1,653 |
| .200-.249 | 878 | 905 | 1,063 |
| .250-.299 | 327 | 293 | 570 |
| .300-.349 | 52 | 54 | 74 |
| .350-.399 | 10 | 12 | 27 |
| TOTAL | 3,409 | 3,632 | 4,301 |

(Data obtained from Bureau of Criminal Apprehension laboratory and refer to analysis of specimens submitted by local and state police agencies)

[13]

# TABLE 6
## BLOOD ALCOHOL LEVELS IN 1971 DWI ARRESTS

| AGE | TOTAL TESTED | TOTAL NEGATIVE | BLOOD ALCOHOL CONCENTRATION(PERCENT) .010-.049 | .050-.099 | .100-.149 | .150-.249 | .250-over | TOTAL POSITIVE | % AGE GRP POS | % OF ALL POS CASES |
|---|---|---|---|---|---|---|---|---|---|---|
| Not Determined | 639 | 30 | 8 | 42 | 79 | 382 | 98 | 609 | 95.5 | 14.7 |
| 15 and under | 9 | 2 | 3 | 2 | | 2 | | 7 | 77.8 | .2 |
| 16-20 | 475 | 48 | 16 | 68 | 89 | 245 | 9 | 427 | 89.9 | 10.4 |
| 21-24 | 656 | 15 | 11 | 47 | 98 | 440 | 45 | 641 | 98.0 | 15.5 |
| 25-34 | 772 | 15 | 7 | 27 | 73 | 534 | 116 | 757 | 97.7 | 18.1 |
| 35-44 | 608 | 17 | 2 | 8 | 47 | 381 | 153 | 591 | 97.3 | 14.4 |
| 45-54 | 617 | 12 | 2 | 15 | 38 | 389 | 161 | 605 | 98.2 | 14.6 |
| 55-64 | 370 | 11 | 2 | 10 | 23 | 255 | 69 | 359 | 97.1 | 8.7 |
| 65-over | 155 | 16 | 1 | 10 | 22 | 88 | 18 | 139 | 89.6 | 3.4 |
| TOTALS | 4,301 | 166 | 52 | 229 | 469 | 2,716 | 669 | 4,135 | 96.3 | 100.0 |

NOTE: These data refer to analysis of chemical specimens submitted to the Bureau of Criminal Apprehension laboratory by state and local police agencies

[14]

Part 4. The Drinking Pedestrian

Motor vehicle crashes accounted for 157 pedestrian fatalities in 1971, an increase of 8 over the previous year. Of 44 pedestrians tested for blood alcohol content, 30 (68.2 percent) proved alcohol positive, and 23 of the 30 (76.7 percent) tested at or above the .10 percent level of intoxication.

Eighteen, or more than half, of the pedestrians who tested alcohol positive were killed on county roads or city streets. A third of the alcohol-positive fatalities, or 10, were 65 or older, and 5 were below the legal age for drinking. The hours between 9 p.m. and midnight were the most dangerous for the drinking pedestrian, with 12 alcohol-positive pedestrians killed during that period. Thirteen, or almost half, of the alcohol-positive pedestrian fatalities were killed in December and January; no drinking pedestrians were killed in May and June.

TABLE 1
DRINKING PEDESTRIAN FACTS

| 1968 | % | 1969 | % | 1970 | % | 1971 | % | |
|---|---|---|---|---|---|---|---|---|
| 122 | | 114 | | 149 | | 157 | | pedestrians were killed in motor vehicle crashes* |
| 46 | 37.7% | 34 | 29.8% | 41 | 27.5% | 44 | 28.0% | fatally injured pedestrians were tested for alcohol content (percent of all pedestrians killed) |
| 11 | 23.9% | 17 | 50.0% | 20 | 48.7% | 30 | 68.2% | of those tested had alcohol in their system (called positive cases) |
| 10 | 91.0% | 15 | 88.1% | 14 | 70.0% | 23 | 76.7% | of the positive cases were at or above the 0.10% level of intoxication |
| 4 | 36.4% | 2 | 11.8% | 3 | 15.0% | 10 | 33.3% | of the positive cases were 65 or older |

*Includes pedestrians killed in crashes in which striking the pedestrian was the second event.

# TABLE 2
## PEDESTRIAN FATALITIES
## by
## Blood Alcohol Concentration and Road Classification of Crash

| ROAD CLASS | TOTAL TESTED | TOTAL NEGATIVE | BLOOD ALCOHOL CONCENTRATION (PERCENT) .010-.049 M | .010-.049 F | .050-.099 M | .050-.099 F | .100-.149 M | .100-.149 F | .150-.249 M | .150-.249 F | .250-over M | .250-over F | TOTAL POSITIVE | PERCENT OF GROUP TESTING POSITIVE | PERCENT OF ALL POSITIVE CASES |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| INTERSTATE-rural | 1 | 1 | | | | | | | | | | | 0 | 0.0 | 0.0 |
| INTERSTATE-urban | 3 | 0 | | | | | | | 3 | | | | 3 | 100.0 | 10.0 |
| TRUNK HWY-rural | 4 | 1 | | 1 | 1 | | | | 1 | | | | 3 | 75.0 | 10.0 |
| TRUNK HWY-urban | 9 | 3 | | | | 2 | | | 4 | | | | 6 | 66.7 | 20.0 |
| COUNTY ROAD | 10 | 1 | 1 | | 2 | | 1 | | 3 | | 1 | 1 | 9 | 90.0 | 30.0 |
| CITY STREET | 17 | 8 | | | | | 1 | 1 | 2 | 1 | 4 | | 9 | 52.9 | 30.0 |
| TOWNSHIP ROAD | 0 | 0 | | | | | | | | | | | 0 | 0.0 | 0.0 |
| TOTAL | 44 | 14 | 2 | | 5 | | 3 | | 14 | | 6 | | 30 | 68.2 | 100.0 |

M = Male

F = Female

[16]

# TABLE 3
# PEDESTRIAN FATALITIES
# by
# Blood Alcohol Concentration and Age

| AGE | TOTAL TESTED | TOTAL NEGATIVE | BLOOD ALCOHOL CONCENTRATION (PERCENT) .010-.049 M | F | .050-.099 M | F | .100-.149 M | F | .150-.249 M | F | .250-over M | F | TOTAL POSITIVE | PERCENT OF GROUP TESTING POSITIVE | PERCENT OF ALL POSITIVE CASE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0-20 | 9 | 4 | 1 | | | | | | 3 | 1 | | | 5 | 55.6 | 16.7 |
| 21-24 | 2 | 1 | | | | | | | | | | 1 | 1 | 50.0 | 3.3 |
| 25-29 | 1 | 1 | | | | | | | | | | | 0 | 0.0 | 0.0 |
| 30-34 | 1 | 1 | | | | | | | | | | | 0 | 0.0 | 0.0 |
| 35-39 | 0 | 0 | | | | | | | | | | | 0 | 0.0 | 0.0 |
| 40-44 | 2 | 0 | | | | | | | 1 | | 1 | | 2 | 100.0 | 6.8 |
| 45-49 | 4 | 1 | | | | 1 | | | 1 | | 1 | | 3 | 75.0 | 10.0 |
| 50-54 | 5 | 1 | | 1 | 1 | 1 | | | 1 | | | | 4 | 80.0 | 13.3 |
| 55-59 | 2 | 1 | | | | | | | 1 | | | | 1 | 50.0 | 3.3 |
| 60-64 | 4 | 0 | | | | | | | 3 | | 1 | | 4 | 100.0 | 13.3 |
| 65-up | 14 | 4 | | | 2 | | 2 | 1 | 3 | | 2 | | 10 | 71.4 | 33.3 |
| TOTAL | 44 | 14 | 2 | | 5 | | 3 | | 14 | | 6 | | 30 | 68.2 | 100.0 |

M = Male

F - Female

[17]

# TABLE 4
# PEDESTRIAN FATALITIES
# by
# Blood Alcohol Concentration and Time of Crash

| TIME | TOTAL TESTED | TOTAL NEGATIVE | BLOOD ALCOHOL CONCENTRATION (PERCENT) .010-.049 M | .010-.049 F | .050-.099 M | .050-.099 F | .100-.149 M | .100-.149 F | .150-.249 M | .150-.249 F | .250-over M | .250-over F | TOTAL POSITIVE | PERCENT OF GROUP TESTING POSITIVE | PERCENT OF ALL POSITIVE CASES |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mid-3am | 8 | 2 | | | 1 | | | | 4 | | 1 | | 6 | 75.0 | 20.0 |
| 3am-6am | 1 | 1 | | | | | | | | | | | 0 | 0.0 | 0.0 |
| 6am-9am | 0 | 0 | | | | | | | | | | | 0 | 0.0 | 0.0 |
| 9am-Noon | 0 | 0 | | | | | | | | | | | 0 | 0.0 | 0.0 |
| Noon-3pm | 1 | 1 | | | | | | | | | | | 0 | 0.0 | 0.0 |
| 3pm-6pm | 8 | 3 | | | | 1 | | 1 | 2 | | | 1 | 5 | 62.5 | 16.7 |
| 6pm-9pm | 10 | 3 | 1 | 1 | 1 | | 1 | | 2 | | 1 | | 7 | 70.0 | 23.3 |
| 9pm-Mid | 16 | 4 | | | 1 | 1 | 1 | | 5 | 1 | 3 | | 12 | 75.0 | 40.0 |
| TOTAL | 44 | 14 | 2 | | 5 | | 3 | | 14 | | 6 | | 30 | 68.2 | 100.0 |

M = Male

F = Female

[18]

# TABLE 5
## PEDESTRIAN FATALITIES
## by
## Blood Alcohol Concentration and Month of Crash

| MONTH | TOTAL TESTED | TOTAL NEGATIVE | BLOOD ALCOHOL CONCENTRATION (PERCENT) .010-.041 M | .010-.041 F | .050-.099 M | .050-.099 F | .100-.149 M | .100-.149 F | .150-.249 M | .150-.249 F | .250-over M | .250-over F | TOTAL POSITIVE | PERCENT OF GROUP TESTING POSITIVE | PERCENT OF ALL POSITIVE CASES |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| January | 7 | 3 | | | | | | 1 | 2 | | 1 | | 4 | 57.1 | 13.3 |
| February | 1 | 0 | 1 | | | | | | | | | | 1 | 100.0 | 3.3 |
| March | 4 | 2 | | | | | | | 2 | | | | 2 | 50.0 | 6.7 |
| April | 3 | 0 | | | | | 1 | | | | 2 | | 3 | 100.0 | 10.0 |
| May | 0 | 0 | | | | | | | | | | | 0 | 0.0 | 0.0 |
| June | 0 | 0 | | | | | | | | | | | 0 | 0.0 | 0.0 |
| July | 3 | 0 | | | 1 | | 1 | | | | 1 | | 3 | 100.0 | 10.0 |
| August | 2 | 0 | | | 1 | | | | 1 | | | | 2 | 100.0 | 6.7 |
| September | 5 | 3 | | | | | | | 1 | 1 | | | 2 | 40.0 | 6.7 |
| October | 4 | 1 | | 1 | | 1 | | | 1 | | | | 3 | 75.0 | 10.0 |
| November | 3 | 2 | | | | | | | 1 | | | | 1 | 33.3 | 3.3 |
| December | 12 | 3 | | | 1 | 1 | | | 5 | | 1 | 1 | 9 | 75.0 | 30.0 |
| TOTAL | 44 | 14 | 2 | | 5 | | 3 | | 14 | | 6 | | 30 | 68.2 | 100.0 |

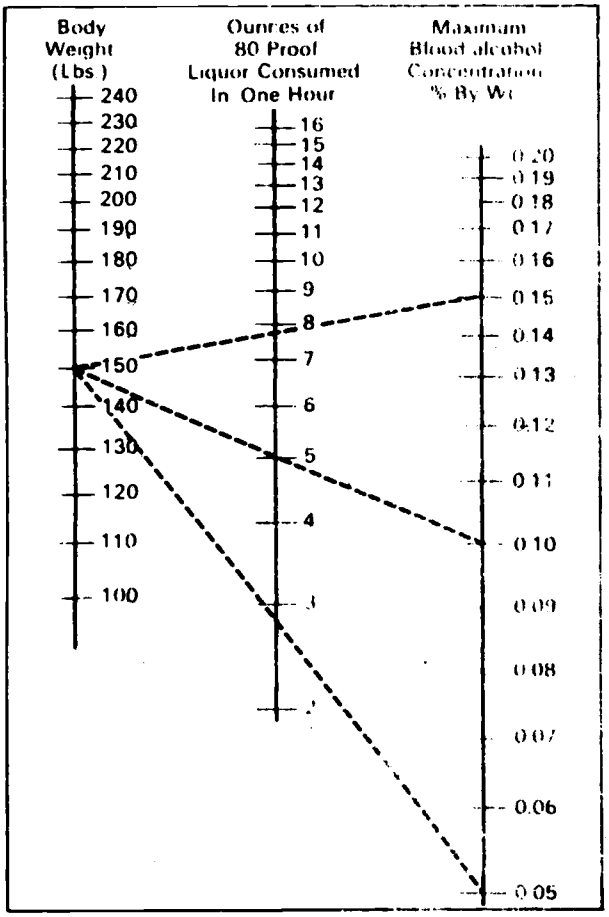
M = Male

F = Female

[19]

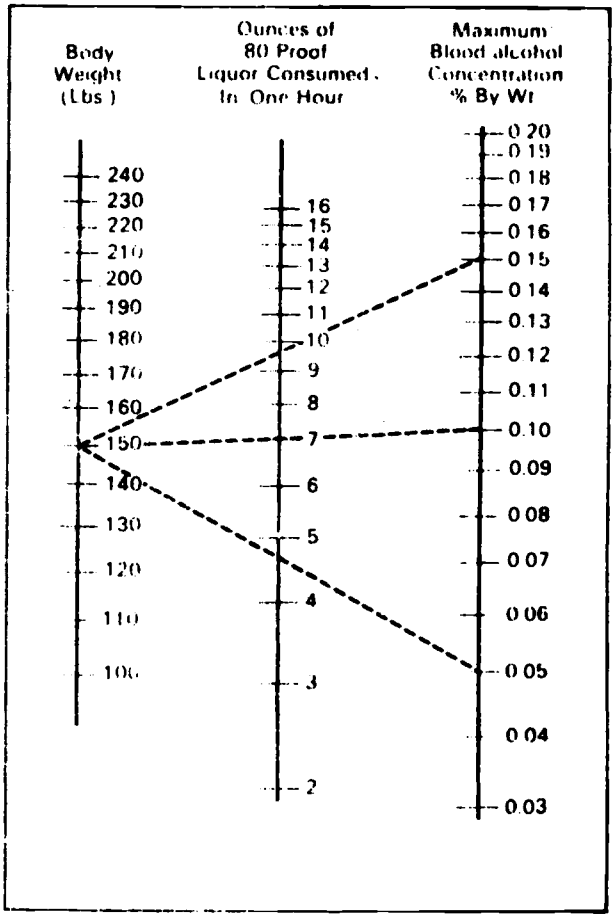
## ESTIMATED AMOUNT OF 80 PROOF LIQUOR NEEDED TO REACH APPROXIMATE GIVEN LEVELS OF ALCOHOL IN THE BLOOD

### *"EMPTY STOMACH"*
### DURING A ONE-HOUR PERIOD* WITH LITTLE OR NO FOOD INTAKE PRIOR TO DRINKING




Adapted from a chart by U.S. Department of Health, Education and Welfare

## *"FULL STOMACH"*
## DURING A ONE HOUR PERIOD* OCCURRING BETWEEN ONE AND TWO HOURS AFTER AN AVERAGE MEAL




Adapted from a chart by Royal Canadian Mounted Police

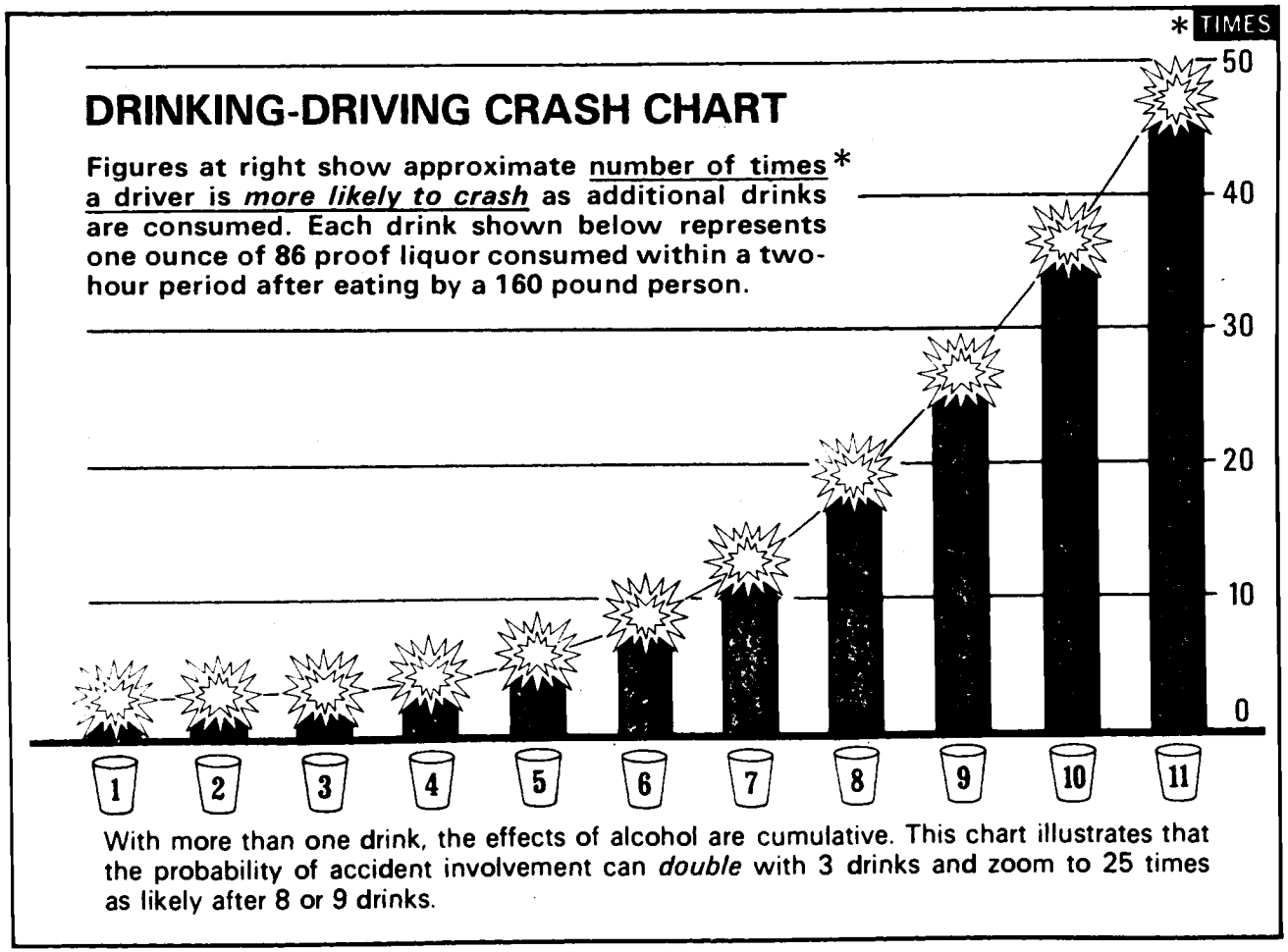
*The rate of elimination of alcohol from the bloodstream is approximately 0.015% per hour. Therefore, subtract 0.015% from blood-alcohol concentration indicated on above charts for each hour after the start of drinking.

The examples above show the approximate *average* amount of 80 proof liquor a 150-pound person would have to consume in a one-hour period to reach 0.10%, the percentage-weight of alcohol in the bloodstream that is presumptive of intoxication.

To determine the approximate average number of ounces of 80 proof liquor needed in a one-hour period to reach 0.10%, draw a line from BODY WEIGHT to 0.10%. The line will intersect the average number of ounces needed to produce 0.10%. Follow the same procedure to determine the amount of liquor needed to reach other blood-alcohol concentrations, such as 0.05%, 0.15%, etc.

Charts show *rough averages only.* Many factors affect the rate of alcohol absorption into the bloodstream. Amount of food consumed, kind of food and drink consumed, and percentage of fatty tissue in the body, for examples, can vary blood-alcohol concentration values.

[20]




## DRINKING-DRIVING CRASH CHART

Figures at right show approximate number of times * a driver is *more likely to crash* as additional drinks are consumed. Each drink shown below represents one ounce of 86 proof liquor consumed within a two-hour period after eating by a 160 pound person.

With more than one drink, the effects of alcohol are cumulative. This chart illustrates that the probability of accident involvement can *double* with 3 drinks and zoom to 25 times as likely after 8 or 9 drinks.

**ITEM 21 — DEFENDANTS' EXHIBIT 8**
**(EXTRACT)**

PROCEEDINGS OF THE JOINT CONFERENCE
ON ALCOHOL ABUSE AND ALCOHOLISM

February 21-23, 1972

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U.S. Department of Health, Education and Welfare
U.S. Department of Justice
U.S. Department of Transportation

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National Institute of Mental Health
National Institute on Alcohol Abuse and Alcoholism

---

DHEW Publication No. (HSM) 73-9051

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* * *

[109] YOUTH, ALCOHOL, AND
COLLISION-INVOLVEMENT

Richard Zylam
Center of Alcohol Studies
Rutgers — The State University
New Brunswick, New Jersey

* * *

[110] Usage is more prevalent among urban youth than among rural and small-town youth.

There are strong religious and ethnic influences at work. A majority of Jews are users of beverage alcohol but indications of problem drinking are almost non-existent. Catholic youth and those who claim no religious affiliation are among the more frequent users, with a higher proportion of heavy drinkers.

* * *

[118]

*Does Driving After Drinking Among Youthful Drivers Account For Their High Frequency of Collision-Involvement?*

The Grand Rapids Study established the fact that elevated BAC's were the most important variable in collision-involvement and that age was second most important. That the young and the very old drivers have the poorest collision experience and middle-age drivers appear in collisions less often than would be expected has already been discussed. The question now arises as to whether that overinvolvement of youth is related to the use of alcohol.

In another earlier paper also based on data from the Grand Rapids Study, Zylam (64) stratified the data into eight 3-hour periods to re-examine the relationship of collision-involvement to alcohol and various demographic characteristics as they were related to the time of day. It was found that the frequency of elevated BAC's varied widely over time of day and so did the mixture of demographic variables. For example, between 3 a.m. and 6 a.m., 22 percent of the control had BAC's of 0.05 percent and higher, but between 9 a.m. and noon just 0.3% (three in every thousand) had BAC's in that range, and between 3 a.m. and 6 a.m. only 6 percent

of the control drivers were female as compared with 26 percent between noon and 3 p.m. These are just two examples of many such differences found.

These wide variations in the makeup of the driving population over time of day were reflected in the collision-involvement of every variable examined. In the post-midnight hours, even drivers with BAC's as high as 0.07 percent appeared in collisions less often than those who had nothing to drink, but in rush-hour traffic the very low BAC's appeared in collisions slightly more often than those who had nothing to drink. The collision-involvement of the different age groups also varied over time of day. It is [120] quite likely that those variations are dependent on such variables as the mix of demographic characteristics, density of traffic and experience in coping with traffic problems, purpose for driving, and the use or non-use of alcohol.

Table 4 shows the distribution of age groups among the control and collision drivers between 6 a.m. and 9 a.m. and the collision-involvement indices as derived from a chi-square analysis. Again it can be seen that the young and old drivers are overrepresented in the collision column. The 16- and 17-year old drivers appear in collision 75 percent more often than would be expected from their representation in the population-at-risk during that period, and the other age groups under 25 years also appeared in collisions substantially more often than expected. Is this overrepresentation related to the use of alcohol? The answer must be "no." Of 135 drivers under 25 years old in the control for that time period, just 4 — all of them older than 20 years — had been drinking, and among 132 drivers between 16 and 24 years old who were involved in collisions during that period, just 2 had been drinking. In fact, of 795 drivers

TABLE 3.

DISTRIBUTION OF AGE GROUPS AMONG THE CONTROL DRIVERS AND COLLISION-INVOLVED DRIVERS IN GRAND RAPIDS, WITH COLLISION-INVOLVEMENT INDICES

| Age Groups | | 15-19 | 20-24 | 25-34 | 35-44 | 45-54 | 55-64 | 65-74 | 75-Older | Totals |
|---|---|---|---|---|---|---|---|---|---|---|
| Control group | N | 689 | 950 | 1608 | 1682 | 1317 | 767 | 292 | 49 | 7354 |
| | % | 9.37 | 12.92 | 21.87 | 22.87 | 17.91 | 10.43 | 3.97 | 0.67 | 100.00 |
| Collision group | N | 1482 | 1612 | 1910 | 1708 | 1192 | 855 | 425 | 125 | 9309 |
| | % | 15.92 | 17.32 | 20.53 | 18.35 | 12.80 | 9.18 | 4.57 | 1.34 | 100.00 |
| Totals | N | 2171 | 2562 | 3518 | 3390 | 2509 | 1622 | 717 | 174 | 16663 |
| | % | 13.03 | 15.38 | 21.11 | 20.34 | 15.06 | 9.73 | 4.30 | 1.04 | 99.99 |
| Collision involvement index[1] | | +22.19 | +12.63 | -2.82 | -9.81 | -14.96 | -5.64 | +6.10 | +28.59 | |

Sources: Previously unpublished data from Grand Rapids Study. $X^2 = 330.89$: d.f. 7; $p < .001$

1 See Table 2, Footnote 2.

[121]

## TABLE 4.
## DISTRIBUTION OF AGE GROUPS AMONG ALL TESTED CONTROL DRIVE AND ALL TESTED COLLISION-INVOLVED DRIVERS IN GRAND RAPIDS BETWEEN 6 A.M. AND 9 A.M., WITH COLLISION-INVOLVEMENT INDICES[1]

| Age Groups | | 16-17 | 18-19 | 20-24 | 25-34 | 35-44 | 45-54 | 55-64 | 65-69 | 70-Older | Totals |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Control group | N | 8 | 38 | 89 | 178 | 176 | 182 | 97 | 19 | 8 | 795 |
| | % | 1.01 | 4.78 | 11.19 | 22.39 | 22.14 | 22.89 | 12.20 | 2.39 | 1.01 | 100.00 |
| Collision group | N | 17 | 40 | 75 | 116 | 111 | 70 | 53 | 14 | 7 | 503 |
| | % | 3.38 | 7.94 | 14.91 | 23.06 | 22.07 | 13.92 | 10.54 | 2.78 | 1.39 | 100.00 |
| Totals | N | 25 | 78 | 164 | 294 | 287 | 252 | 150 | 33 | 15 | 1298 |
| | % | 1.93 | 6.01 | 12.63 | 22.65 | 22.11 | 19.41 | 11.56 | 2.54 | 1.16 | 100.00 |
| Collision involvement index[2] | | +75.47 | +32.33 | +18.01 | +1.82 | -0.20 | -28.32 | -8.82 | +9.48 | +20.42 | |

Source: Data from Grand Rapids Study. $X^2 = 31.71$; d.f.8; $p<.001$

1. Cases in which the driver may have refused to cooperate, or in which a collision-involved driver was not tested, or in which the breath specimen was lost through mechanical failure are not included in these data; hence, the term "tested."

2. See Table 2, Footnote 2.

of all ages in the control during that period, just 8 had BAC's of 0.05 percent and higher, and of 503 drivers involved in collisions, just 10 were in that range. When all drivers with positive BAC's were deleted from the data and the chi-square analysis repeated, the resulting collision-involvement indices were almost identical to those shown in Table 4; if anything, the young and old drivers showed up slightly worse. This similarity in results, with both tests showing very high-collision-involvement rates for the very young driver is probably achieved because there were very few drinkers on the streets at that time and, without the modifying effects of alcohol, the problems related to youth and driving experience overshadowed the effects of alcohol and other variables.

A similar series of tests was run for each 3-hour period of the day but for the sake of brevity, only the period between 9 p.m. and midnight will be discussed. These are leisure hours when more drinking can be expected and when much driving is done for recreational purposes; it is reasonable to assume that the two activities might be combined by some drivers. Tables 5 and 6 show the distribution of BAC's among the various age groups in the control and collision groups for the period 9 p.m. to midnight, and it can be seen that there is a good deal of driving-after-drinking going on — even among young drivers.

If younger drivers were involved in more collisions than older drivers because of the excessive use of alcohol, it would be expected that: (a) young drivers would show a higher frequency of driving-after-drinking [124] than older drivers; and (b) that young drivers would have a worse collision-involvement index among all drivers, whether they had been drinking or not, than among alcohol-free drivers. A comparison of Tables 7

TABLE 5.
DISTRIBUTION OF BAC'S BY AGE GROUP AMONG CONTROL DRIVERS BETWEEN 9 P.M. AND MIDNIGHT
Blood Alcohol Concentration

| Age Groups | | 0.00 | 0.01 0.04 | 0.05 0.07 | 0.08 0.10 | 0.11 0.14 | 0.15 Over | Totals | % |
|---|---|---|---|---|---|---|---|---|---|
| 16-17 | N | 37 | | | | | | 37 | 4.95 |
| | % | 100.0 | | | | | | 100.00 | |
| 18-19 | N | 81 | 4 | 1 | | | | 86 | 11.50 |
| | % | 94.19 | 4.65 | 1.16 | | | | 100.00 | |
| 20-24 | N | 132 | 19 | 3 | | 2 | | 156 | 20.86 |
| | % | 84.62 | 12.18 | 1.92 | | 1.28 | | 100.00 | |
| 25-34 | N | 129 | 30 | 6 | 2 | | | 167 | 22.33 |
| | % | 77.25 | 17.96 | 3.59 | 1.20 | | | 100.00 | |
| 35-44 | N | 105 | 18 | 5 | 3 | 4 | 2 | 137 | 18.32 |
| | % | 76.64 | 13.14 | 3.65 | 2.19 | 2.92 | 1.46 | 100.00 | |
| 45-54 | N | 79 | 15 | 2 | 1 | 1 | 2 | 100 | 13.37 |
| | % | 79.00 | 15.00 | 2.00 | 1.00 | 1.00 | 2.00 | 100.00 | |
| 55-64 | N | 41 | 6 | 1 | 1 | 1 | | 50 | 6.68 |
| | % | 82.00 | 12.00 | 2.00 | 2.00 | 2.00 | | 100.00 | |
| 65-69 | N | 8 | 1 | | | | | 9 | 1.20 |
| | % | 88.89 | 11.11 | | | | | 100.00 | |
| 70-over | N | 6 | | | | | | 6 | 0.80 |
| | % | 100.00 | | | | | | 100.00 | |
| Totals | N | 618 | 93 | 18 | 7 | 8 | 4 | 748 | 100.00 |
| | % | 82.62 | 12.43 | 2.41 | 0.94 | 1.07 | 0.53 | 100.00 | |

Source: Data from Grand Rapids Study.

and 8 shows that this is not true. In the absence of alcohol, age is an even more important predictor of collision-involvement. This happens because the higher BAC's are concentrated among the middle-age or "best" driving groups, and it can be assumed that those high

[123]

TABLE 6.
DISTRIBUTION OF BAC'S BY AGE GROUP AMONG COLLISION-INVOLVED DRIVERS BETWEEN 9 A.M. AND MIDNIGHT
Blood Alcohol Concentration

| Age Groups | | 0.00 | 0.01 0.04 | 0.05 0.07 | 0.08 0 10 | 0.11 0.14 | 0.15 over | Totals | % |
|---|---|---|---|---|---|---|---|---|---|
| 16-17 | N | 69 | 2 | | | | | 71 | 10.96 |
| | % | 97.18 | 2.82 | | | | | 100.00 | |
| 18-19 | N | 92 | 8 | 1 | 1 | 2 | 2 | 106 | 16.36 |
| | % | 86.79 | 7.55 | 0.94 | 0.94 | 1.89 | 1.89 | 100.00 | |
| 20-24 | N | 99 | 15 | 2 | 5 | 5 | 8 | 134 | 20.68 |
| | % | 73.88 | 11.19 | 1.49 | 3.73 | 3.73 | 5.97 | 99.99 | |
| 25-34 | N | 68 | 23 | 7 | 10 | 11 | 10 | 129 | 19.91 |
| | % | 52.71 | 17.83 | 5.43 | 7.75 | 8.53 | 7.75 | 100.00 | |
| 35-44 | N | 35 | 9 | 9 | 3 | 8 | 9 | 73 | 11.27 |
| | % | 47.95 | 12.33 | 12.33 | 4.11 | 10.96 | 12.33 | 100.01 | |
| 45-54 | N | 34 | 8 | 3 | 5 | 3 | 7 | 60 | 9.26 |
| | % | 56.67 | 13.33 | 5.00 | 8.33 | 5.00 | 11.67 | 100.00 | |
| 55-64 | N | 38 | 3 | 5 | 1 | 3 | 2 | 52 | 8.02 |
| | % | 73.08 | 5.77 | 9.62 | 1.92 | 5.77 | 3.85 | 100.01 | |
| 65-69 | N | 8 | | | | | 1 | 9 | 1.39 |
| | % | 88.89 | | | | | 11.11 | 100.00 | |
| 70-over | N | 12 | | | 1 | | 1 | 14 | 2.16 |
| | % | 85.71 | | | 7.14 | | 7.14 | 99.99 | |
| Totals | N | 455 | 68 | 27 | 26 | 32 | 40 | 648 | 100.01 |
| | % | 70.22 | 10.49 | 4.17 | 4.01 | 4.94 | 6.17 | 100.00 | |

Source: Data from Grand Rapids Study.

BAC's are accompanied by some impairment. When the positive BAC's are removed from the data the impaired drivers are also removed, so the "best" age groups become better and the "worst" age groups show up relatively worse. It must be concluded that characteristics

related to age are more important to the collision-involvement of youth and old age than alcohol.[1]

*Are Youthful Drivers More Likely To Be Involved In Collisions At Lower BAC's Than Older Or More Experienced Drivers?*

Because age seems to be a stronger factor than alcohol in the collision-involvement of youth, it does not follow that alcohol can be ruled out as a causal factor in some youthful collisions. Tables 5 and 6 show that some of the youthful Grand Rapids drivers had been drinking and that the positive BAC's are more frequent among the collision-involved drivers than in the control group. Hyman (48) examined the collision-vulnerability and BAC's in the Grand Rapids Study by demographic characteristics and found that young drivers are more likely to be involved in collisions at low BAC's than older drivers. Table 9 presents his calculations by age, sex, and BAC. It can be seen that young drivers (and old drivers) especially males, have a higher vulnerability ratio than intermediate age groups at each BAC and that the different between age groups increases at each level of BAC. For male drivers under 18, who already had the highest vulnerability ratio at 0.00 BAC, the ratio increased three-fold even at the one-or-two drink level. There was not sufficient data to carry the test further for that age group. For the males 18 to 19 years old the collision-vulnerability ration increased from 1.55 at 0.00 percent BAC to 2.29 at 0.01-0.04 percent, and 4.17 at the 0.05-

[1]It is worth noting that, given this method of analysis, older drivers have a collision experience as bad or worse than that of young drivers and that their involvement index is much worse during hours of darkness than in daylight (Tables 4-8). This suggests the need for more study of the gerontological changes that may affect the operation of motor vehicles.

0.09 percent BAC level. The vulnerability ratio for 20 to 24 year old males was the same (1.12) at both the 0.00 percent level and at the 0.01-0.04 percent level, but increased to 1.78 at 0.05-0.09 percent and 9.38 at 0.10 percent BAC and higher, and the ratio for drivers between 35 and 64 years old was lower at BAC 0.05-0.09 percent than for drivers under 20 who had nothing to drink. This seems to reconfirm the earlier statement by Zylam (67) and laboratory work by Carpenter *et al.* (68), that experienced drinkers, who are also quite likely experienced drivers, can indulge in small amounts of alcohol and still perform better than the less proficient drivers who had nothing to [128] drink. This could be true even though they may have deteriorated from their pre-drinking proficiency.[1]

Drivers over 69 years old have a vulnerability ratio very similar to that of teenagers, although probably for very different reasons.

*Is There A Stronger Relationship Between Youthful Drinking and Fatal Crashes Than Between Youthful Drinking and "All" Collisions?*

The most recent studies of fatal crashes show that a disproportionate number of them involved drivers under 25. It is often stated that many of those younger drivers, especially those between 20 and 25 years old, had engaged in heavy drinking prior to their fatal trip. Although even one such case might be judged too many, younger drivers killed in crashes actually show lower frequencies of alcohol-involvement than do those 5, 10,

[1]This indicates that the widely used curve from the Grand Rapids Study showing the probability of causing a collision at various BAC's cannot be applied indiscriminately to every age group. (67)

## TABLE 7.
## DISTRIBUTION OF AGE GROUPS AMONG ALL TESTED CONTROL DRIVERS AND ALL TESTED COLLISION-INVOLVED DRIVERS IN GRAND RAPIDS BETWEEN 9 P.M. AND MIDNIGHT, WITH COLLISION-INVOLVEMENT INDICES[1]

| Age Groups | | 16-17 | 18-19 | 20-24 | 25-34 | 35-44 | 45-54 | 55-64 | 65-69 | 70-over | Totals |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Control group | N | 37 | 86 | 156 | 167 | 137 | 100 | 50 | 9 | 6 | 748 |
| | % | 4.95 | 11.50 | 20.86 | 22.33 | 18.32 | 13.37 | 6.68 | 1.20 | 0.80 | 100.01 |
| Collision group | N | 71 | 106 | 134 | 129 | 73 | 60 | 52 | 9 | 14 | 648 |
| | % | 10.96 | 16.36 | 20.68 | 19.91 | 11.27 | 9.26 | 8.02 | 1.39 | 2.16 | 100.01 |
| Totals | N | 108 | 192 | 290 | 296 | 210 | 160 | 102 | 18 | 20 | 1396 |
| | % | 7.74 | 13.75 | 20.77 | 21.20 | 15.04 | 11.46 | 7.31 | 1.29 | 1.43 | 99.99 |
| Collision involvement index[2] | | +41.62 | +18.94 | -0.46 | -6.11 | -25.11 | -19.21 | +9.83 | +7.72 | +50.80 | |

1 See Table 4, Footnote 1.

$X^2 = 45.15$; d.f.8; $p. < .001$

2 See Table 2, Footnote 2.

Source: Data from Grand Rapids Study.

[126]

TABLE 8.

DISTRIBUTION OF AGE GROUPS AMONG ALCOHOL-FREE CONTROL DRIVERS AND ALCOHOL-FREE COLLISION-INVOLVED DRIVERS IN GRAND RAPIDS BETWEEN 9 P.M. AND MIDNIGHT, WITH COLLISION-INVOLVEMENT INDICES

| Age Groups | | 16-17 | 18-19 | 20-24 | 25-34 | 35-44 | 45-54 | 55-64 | 65-69 | 70-over | Totals |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Control group | N | 37 | 81 | 132 | 129 | 105 | 79 | 41 | 8 | 6 | 618 |
| | % | 5.99 | 13.11 | 21.36 | 20.87 | 16.99 | 12.78 | 6.63 | 1.29 | 0.97 | 99.99 |
| Collision group | N | 69 | 92 | 99 | 68 | 35 | 34 | 38 | 8 | 12 | 455 |
| | % | 15.16 | 20.22 | 21.76 | 14.95 | 7.69 | 7.48 | 8.35 | 1.76 | 2.64 | 100.01 |
| Totals | N | 106 | 173 | 231 | 197 | 140 | 113 | 79 | 16 | 18 | 1073 |
| | % | 9.88 | 16.12 | 21.53 | 18.36 | 13.05 | 10.53 | 7.36 | 1.49 | 1.68 | 100.00 |
| Collision-involvement index[1] | | +53.51 | +25.41 | +1.07 | -18.60 | -41.04 | -29.04 | +13.43 | +17.91 | +57.21 | |

Source: Data from Grand Rapids Study. $X^2 = 65.75$; d.f. 8; $p. < .001$

1 See Table 2, Footnote 2.

# TABLE 9.
# PERCENTAGES OF ACCIDENT-INVOLVED DRIVERS (A) AND OF CONTROL DRIVERS (C), AND ACCIDENT-VULNERABILITY RATIOS (A-VR), IN EACH AGE-SEX-BAC CATEGORY

| | Blood Alcohol Concentration | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0.00% | | | 0.01%–0.04% | | | 0.05%–0.09% | | | 0.10%+ | | |
| | A | C | A-VR | A | C | A-VR | A | C | A-VR | A | C | A-VR |
| *Sex*[a] | | | | | | | | | | | | |
| Men | 63.3 | 69.3 | 0.91 | 5.8 | 6.8 | 0.85 | 3.2 | 2.2 | 1.45 | 5.5 | 0.8 | 6.88 |
| Women | 20.1 | 19.7 | 1.02 | 1.0 | 1.0 | 1.00 | 0.3 | 0.2 | 1.50 | 0.8 | 0.0 | c |
| *Age*[b] | | | | | | | | | | | | |
| *Men* | | | | | | | | | | | | |
| <18 | 4.86 | 2.04 | 2.38 | 0.22 | 0.03 | 7.33 | 0.05 | 0.00 | c | 0.02 | 0.00 | c |
| 18–19 | 7.35 | 4.75 | 1.55 | 0.48 | 0.21 | 2.29 | 0.25 | 0.06 | 4.17 | 0.13 | 0.00 | c |
| 20–24 | 11.11 | 9.29 | 1.12 | 1.05 | 0.94 | 1.12 | 0.48 | 0.27 | 1.78 | 0.75 | 0.08 | 9.38 |
| 25–34 | 12.23 | 15.10 | 0.81 | 1.49 | 1.59 | 0.94 | 0.90 | 0.56 | 1.61 | 1.62 | 0.24 | 6.75 |
| 35–44 | 10.25 | 15.00 | 0.68 | 1.10 | 1.54 | 0.71 | 0.67 | 0.59 | 1.14 | 1.50 | 0.27 | 5.56 |
| 45–54 | 7.44 | 11.75 | 0.63 | 0.84 | 1.47 | 0.57 | 0.40 | 0.44 | 0.91 | 0.72 | 0.16 | 4.50 |
| 55–64 | 5.75 | 7.56 | 0.76 | 0.35 | 0.63 | 0.56 | 0.28 | 0.24 | 1.17 | 0.62 | 0.04 | 15.00 |
| 65–69 | 1.74 | 2.10 | 0.83 | 0.15 | 0.27 | 0.56 | 0.08 | 0.06 | 1.25 | 0.13 | 0.01 | 13.00 |
| 70–74 | 1.47 | 0.78 | 1.88 | 0.10 | 0.04 | 2.50 | 0.07 | 0.03 | 2.33 | 0.05 | 0.00 | c |
| 75+ | 1.05 | 0.56 | 1.88 | 0.05 | 0.01 | 5.00 | 0.00 | 0.00 | | 0.00 | 0.00 | |
| *Women* | | | | | | | | | | | | |
| <18 | 1.22 | 0.71 | 1.72 | 0.03 | 0.01 | 3.00 | 0.00 | 0.00 | | 0.00 | 0.00 | |
| 18–19 | 1.81 | 1.56 | 1.16 | 0.05 | 0.06 | 0.83 | 0.02 | 0.01 | 2.00 | 0.05 | 0.00 | c |
| 20–24 | 3.56 | 2.38 | 1.50 | 0.22 | 0.10 | 2.20 | 0.03 | 0.04 | 0.75 | 0.03 | 0.00 | c |
| 25–34 | 3.49 | 4.16 | 0.84 | 0.20 | 0.24 | 0.83 | 0.08 | 0.07 | 1.14 | 0.20 | 0.00 | c |
| 35–44 | 4.34 | 5.03 | 0.86 | 0.23 | 0.30 | 0.77 | 0.12 | 0.06 | 2.00 | 0.25 | 0.00 | c |
| 45–54 | 2.76 | 3.71 | 0.74 | 0.13 | 0.18 | 0.72 | 0.07 | 0.03 | 2.33 | 0.07 | 0.00 | c |
| 55–64 | 1.92 | 1.82 | 1.05 | 0.07 | 0.08 | 0.88 | 0.00 | 0.01 | 0.00 | .13 | 0.00 | c |
| 65–69 | 0.42 | 0.44 | 0.95 | 0.02 | 0.01 | 2.00 | 0.00 | 0.00 | c | .02 | 0.00 | c |
| 70–74 | 0.32 | 0.17 | 1.88 | 0.02 | 0.00 | c | 0.00 | 0.00 | | .00 | 0.00 | |
| 75+ | 0.28 | 0.08 | 3.50 | 0.00 | 0.01 | c | 0.00 | 0.00 | | .00 | 0.00 | |

Source: Reproduced with permission from Quart. J. Stud. Alc., Suppl. No. 4, 1968.,p. 39.

a Total sex and BAC reported: 5988 accident-involved and 7529 control drivers.
b Total sex, age and BAC reported: 5983 accident-involved and 7092 control drivers.
c The ratio cannot be calculated since there are no controls.

and even 20 years their seniors. In Wayne County, Michigan (46) 11 percent of the drivers killed were under 20 years old, of whom 29 percent had BAC's of 0.10 percent or more; while for drivers from 20 to 25 years old (who represented 25 percent of all the driver fatalities), 63 percent had BAC's of 0.10 percent or higher. This compares with drivers from 26 to 35 years old who were killed, among whom 81 percent were at 0.10 percent BAC or higher and those from 36 to 45 years, among whom 73 percent were at that level.[2] Other studies also show low frequencies of high BAC's among young drivers as compared with middle-age drivers.

Initially, it must be recognized that a considerable portion of the overinvolvement of young drivers in fatal crashes may be explained by the greater exposure as described in previous pages. For example, in the Wayne County study the point is made that drivers between 16 and 25 years old comprised 36 percent of the fatalities but only 21 percent of the licensed population as represented in the Michigan Driver Profile (53). The figures relating to driver licenses here are derived from a random sample of the Michigan driver license files and do not allow for exposure. Supposing it were possible to determine the age distribution of all drivers using the highways at the times and places where those

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[2]Regarding these data, Filkins et. al. said "it is now known that the alcohol involvement of the younger crash-involved fatalities is less than that of their older fatality counterparts. Young people are more often involved in crashes, whether it be due to driving inexperience, drinking inexperience, or a combination of the two conditions perhaps exacerbated by more reckless attitudes about driving." (46)

Wayne County fatal crashes occurred and it was learned that 30 percent of the drivers are under 25 rather than the 21 percent as shown in the driver license files; then the [129] overinvolvement of this age group would be reduced by more than 70 percent. If it were found that 36 percent of the drivers on the highways at the times and places of fatal crashes were in that age group,[1] then there would be no overinvolvement of drivers under 25; they will have appeared in collisions in direct proportion to their representation in the driving population.[2] This point must be made because failure to allow for exposure inflates the problem of traffic deaths as it relates to youth. This may be a major source of the alarm over youth involvement in fatal crashes.

It is difficult to reconcile the figures found in studies of fatal crashes with the information presented earlier regarding youthful drinking, youthful driving-after-drinking, and youthful involvement in "all" collisions after drinking. It cannot be said that the large number of alcohol-related fatal crashes involving youth reflect orgy-like drinking on the part of a major segment of the

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[1]In Washtenaw County, adjacent to Wayne County, the survey of drivers in the nighttime traffic showed that more than 48 percent of them were 16 to 25 years old. However, this is probably an unusual situation because two large Universities are located in the sample area. (42)

[2]In the only bonafide controlled study of fatal crashes that appears in the literature, McCarroll and Haddon (55) reported "The case subjects were suggestively *older* [emphasis theirs] in both responsible and questionably responsible groups. However, the differences were not statistically significant. As a result, no age adjustment has been made in the case-control comparisons which follow."

young driver population; nor can it be said that large numbers of young drivers are driving after drinking huge quantities of beverage alcohol. It is more likely that those who are involved in fatal crashes while intoxicated are a typical group, a small group with characteristics that set them apart from the majority of young drivers. A number of studies have already identified such unique characteristics among drivers involved in fatal crashes after heavy drinking as well as among those convicted of driving while intoxicated or impaired, or who are just "bad drivers" (40, 44, 45, 47, 48, 52, 56-63). There is an urgent need to synthesize the studies from the fields of sociology, psychiatry, psychology, education, and other disciplines regarding the problem driver, with the work done in what is generally called the alcohol problem field. Much is known in that field about the etiology of "problem people" which would logically be applicable to the traffic field; however, it is not being used. Knowledge about cultural and religious influences, socioeconomic status, parental practices and family relationships, peer-group pressures and sex identification as they are reflected in drinking practices and attitudes toward drinking must be applied to the alcohol-involved traffic problems field so that this small but tragically important group of problem drinker-drivers can be identified at an earlier age — when major difficulty may still be prevented.

[130]

## SUMMARY AND CONCLUSIONS

A survey of the literature reveals that, while there is great national concern about something called "alcohol and youth," there is little in objective studies to show that excessive drinking (or its usual disapproved accompanying behaviors) is even as frequent in this age cate-

gory as in any of the succeeding 5-year age brackets. In fact, the extent of such problems is markedly less among those usually labeled as youth or teenagers. Many teenagers drink, and by the age of 18 or 19 a majority use beverage alcohol at least occasionally. It is well established that youthful drinking reflects the attitudes and practices of their parents and the influence of cultural and religious backgrounds. Drinking among youth, like drinking among adults, is a societal function and, as among adults, a small minority drink intemperately. This minority frequently engages in other antisocial behavior as well. There is no evidence that the antisocial behavior is caused by alcohol alone. Rather, it is believed that both forms of aberrant behavior reflect the same or similar underlying character or personality problems and the same or similar stressful situations.

The practice of driving after drinking by young people is not as widespread as generally believed. Under the age of 18, driving after drinking is quite rare However, the frequency and intensity of driving after drinking increases rapidly for drivers 18 and 19 years old and the practice for those who are 20 to 25 years old resembles those who are older than 25. The heaviest frequency and greatest intensity, however, occur in various age groups between 25 and 54, depending on which studies are considered.

Young drivers are involved in disproportionate numbers of collisions. However, when allowances are made for exposure by comparing collision-involved drivers with drivers using the highways at the times and places of collision occurrences, rather than with the driver license files, their reported overinvolvement is cut by half. At the same time, using this measurement, the collision-involvement index for drivers over 69 years old is increased several fold. Drivers between 25 and 69

appear in collisions less often than would be expected on the basis of the population-at-risk. Collision-involvement indices also vary widely over the time of day.

Young drivers are not involved in more collisions than older drivers because of the use of alcohol. If that were the case, one would expect to find that young drivers drive more often after drinking than older drivers, and that the collision-involvement index for young drivers would be worse when drinking and nondrinking drivers were considered together than when nondrinkers were considered separately. Neither hypothesis is true. A greater number and proportion of drivers between 25 and 69 is found at every BAC above 0.00 percent. When the age distributions are examined by chi-square, the collision-involvement indices for both the very young and very old drivers are worse when just the nondrinkers are considered than when all drivers are included.

[131] In spite of the less significant role of alcohol in highway crashes involving youth, there is an important relationship of alcohol to youth-involvement in collisions which sharply differentiates them from the other age categories up to age 69. This concerns the impact of small amounts of alcohol; i.e., those resulting in BAC's which are positive but less than 0.05 percent. Among teenagers such low concentrations are an important component in crashes, whereas in all other groups up to age 69 such concentrations are of no significance at all. There is evidence that drivers under 18, who already have the worst collision-vulnerability ratio with nothing to drink, increase that vulnerability threefold after just one or two drinks. At that level (0.01-0.04 percent BAC) all age groups between 25 and 69 appeared in collisions less often than in the control.

Drivers under 25 years old appear to be involved in disproportionate numbers of fatal crashes. However,

whether or not that disproportion is attributable to the heavy use of alcohol is open to question on at least three points: (a) if allowances were made for exposure, the overinvolvement of young drivers would quite likely be reduced substantially; (b) some of the deaths among young drivers probably occur after light to moderate drinking — the kind of drinking that would not have lead to a fatal crash if the driver had been more experienced in either drinking or driving or both; (c) it seems plausible that at least a portion of the youthful fatalities might be attributable to problems associated with youth and inexperience rather than alcohol.

Finally, we cannot blithely explain away a major part of the fatal crash problem among youth and dismiss the remainder as "expected." The fact remains that thousands of young drivers die each year and a substantial number of these unnecessary deaths are related to some use of alcohol. The implication of this paper is that we must put the various sub-problems in their proper perspective before we can make a rational attack on the whole problem. There is a need to apply the knowledge and skills of the alcohol problems field to the alcohol-traffic problem. This would allow both identification of problem people at an earlier age and, hopefully, also prevention of problem drivers. It would also allow identification of problem types of drinking (clearly different for young as compared with older persons) and allow attack on this aspect of unnecessary death and injury on the highways.

## ITEM 22 — DECISION (MEMORANDUM OPINION) (REFERENCE)

[The decision (Memorandum Opinion) of the District Court herein appealed is reported at 399 F.Supp. 1304, and is reproduced at Appendix A to the Jurisdictional Statement herein.]

## ITEM 23 — JUDGMENT (REFERENCE)

[The formal Judgment herein, entered on May 17, 1975, is unreported, but is reproduced at Appendix B to the Jurisdictional Statement herein.]

## CERTIFICATE OF SERVICE

I, Frederick P. Gilbert, a member of the Bar of this Honorable Court and counsel of record for the Appellants herein, do hereby certify that I served three copies of this Appendix upon counsel for all Appellees herein, to wit: upon the Hon. Larry Derryberry, Attorney General of the State of Oklahoma, by mailing the same to him at his office in the State Capitol Building, Oklahoma City, Oklahoma, Attn: Mr. James Gray, Assistant Attorney General, this _____ day of February, 1976, with first class postage thereon fully prepaid.

All Parties required to be served have been served.

FREDERICK P. GILBERT
*Attorney for Appellants*