Traffic Safety Facts
Research Note

Calculating Lives Saved Due to Minimum Drinking Age Laws

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Currently (2004), every State in the United States prohibits purchase or public possession of alcoholic beverages for those under the age of 21. Each year, the National Center for Statistics and Analysis (NCSA) of the National Highway Traffic Safety Administration (NHTSA) publishes an estimate[1] of lives saved due to such bans, referred to more generically as "minimum legal drinking age" (MLDA) laws. This note describes the methodology used, and introduces a slight change in that methodology. The described change will be implemented for the first time in the calculation of the estimate of number of lives saved during the year 2003.

Background

Between 1970 and 1975, 29 States lowered their drinking ages to 18, 19, or 20. By 1983, safety concerns had led many of these States to reverse course. In 1984, the Uniform Drinking Age Act reduced Federal transportation funding to States not prohibiting alcohol "purchase and public possession" for those under age 21. All States eventually restored their legal ages for alcohol purchase and public possession to 21 years.

NHTSA published an analysis in 1985[2] and a follow-up in 1989[3] on the reduction in fatal crash involvements of drivers affected by an increase in the MLDA. The estimated number of lives saved is based on the reduction in target (18-20 years of age) driver involvements and the numbers of fatalities in crashes with those involvements. Thus "lives saved" in this context refers not to a reduction in young driver fatalities, but in all fatalities, driver or passenger, young or old, regardless of alcohol involvement, in crashes where at least one driver was in the targeted age group. NHTSA considers this method reasonable since it is not only young drivers who can be killed in their crashes, but indeed any passenger in any involved vehicle, as well as nonmotorists.

The studies found that the target involvements decreased on average by 13 percent in States where the drinking age had been raised. Thus NHTSA's effectiveness rating of a raised MLDA is 13 percent. The methodology of the effectiveness study can be found in Arnold.[2] The cumulative estimated number of lives saved through 2002, based on Arnold's methodology, is displayed in this note's appendix.

Calculation

NCSA calculates its estimate of lives saved due to MLDA laws as follows:

Let F = the actual number of fatalities in target crashes recorded in NHTSA's Fatality Analysis Recording System (FARS);

Let P = potential fatalities: the number of fatalities that would have been expected in target crashes absent the MLDA 13 percent effect

P is computed from F by finding the number which, when reduced by 13 percent, gives F. Thus F must be (1-.13)*P, or 87 percent of P, so

$(1 - .13)*P = F$, and $P = F/(1-.13)$.

The estimated number of lives saved is then 13 percent of P, so

Lives Saved $= (.13)*P = (.13)*F/(1-.13)$.

The lives saved calculation can also be developed from (P – F) with the same result.

Method Update

One group of crashes not accounted for in past estimates has been the group of crashes with no known drivers of the target age but at least one driver of unknown age. To ignore them assumes that none of the drivers of unknown age were in the target age group. In other estimates of lives saved due to various safety measures such as safety belts and air bags, NCSA's standard practice is to allocate relevant unknowns in FARS in the same proportions as corresponding known values.[4] Starting with reports based on FARS 2003, NCSA will adjust the estimate of lives saved by MLDA laws in a similar fashion. First, the proportion of FARS fatalities in

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crashes involving at least one driver age 18-20, relative to all FARS fatalities, will be calculated. Second, this proportion will be applied to the number of FARS fatalities in crashes involving no known driver of age 18-20 but at least one driver of unknown age. Since breaking the allocation into driver age groups by number of vehicles can involve sparse counts leading to unreliable estimates, the allocation will be done over all crash configurations. The adjustment will result in a slightly higher estimate than would have been made without it.

Since past lives saved figures have been widely published and cited, and the effect of the method update is small, NCSA will not recalculate the estimates for past years.

Example

As an example of the old and new methods, the calculation of lives saved due to minimum drinking age laws in the year 2003 is detailed in this section. In the FARS 2003 Annual Report file, 5,153 fatal crashes occurred where at least one driver of age 18-20 was involved, resulting in 5,923 fatally injured persons (of any age). Under the previous method, the 2003 estimate of lives saved to due to MLDA laws would be:

$.13[5,923/(1-.13)] = .13 (6,808) = 885.04 \approx 885$.

Or, equivalently, $6,808 - 5,923 = 885$.

However, under the method update, counts of crashes with other driver configurations are also involved. The following numbers are needed:

- 5,153 fatal crashes occurred where at least one driver of age 18-20 was involved, resulting in 5,923 fatalities;

- 32,171 fatal crashes occurred where no driver of age 18-20 or of unknown age was involved, resulting in 35,741 fatalities; and

- 928 fatal crashes occurred with no known driver of age 18-20 but at least one driver of unknown age, resulting in 979 fatalities.

To take into account the 979 fatalities of unknown category, they are allocated according to observed proportions where categories are known. In FARS crashes for 2003 of known target status, the proportion in the target category is 5,923/(5,923+35,741)=14.22 percent. This proportion is applied to the 979 for an estimate of how many of the 979 were likely in crashes of target category:

- Estimated additional fatalities in target group = $979(5,923/[5,923+35,741]) = 139.18$

- Estimated lives lost in target category crashes= $5,923+139.18 = 6,062.18$

If MLDA laws reduce fatalities in targeted crashes by 13 percent, then without the laws we would expect to have seen $6,062.18/(1-.13) = 6,968.02$ fatalities. Under the update, the lives saved estimate will be:

- Estimated number of lives saved due to MLDA laws = $.13(6,968.02) = 905.84 \approx 906$.
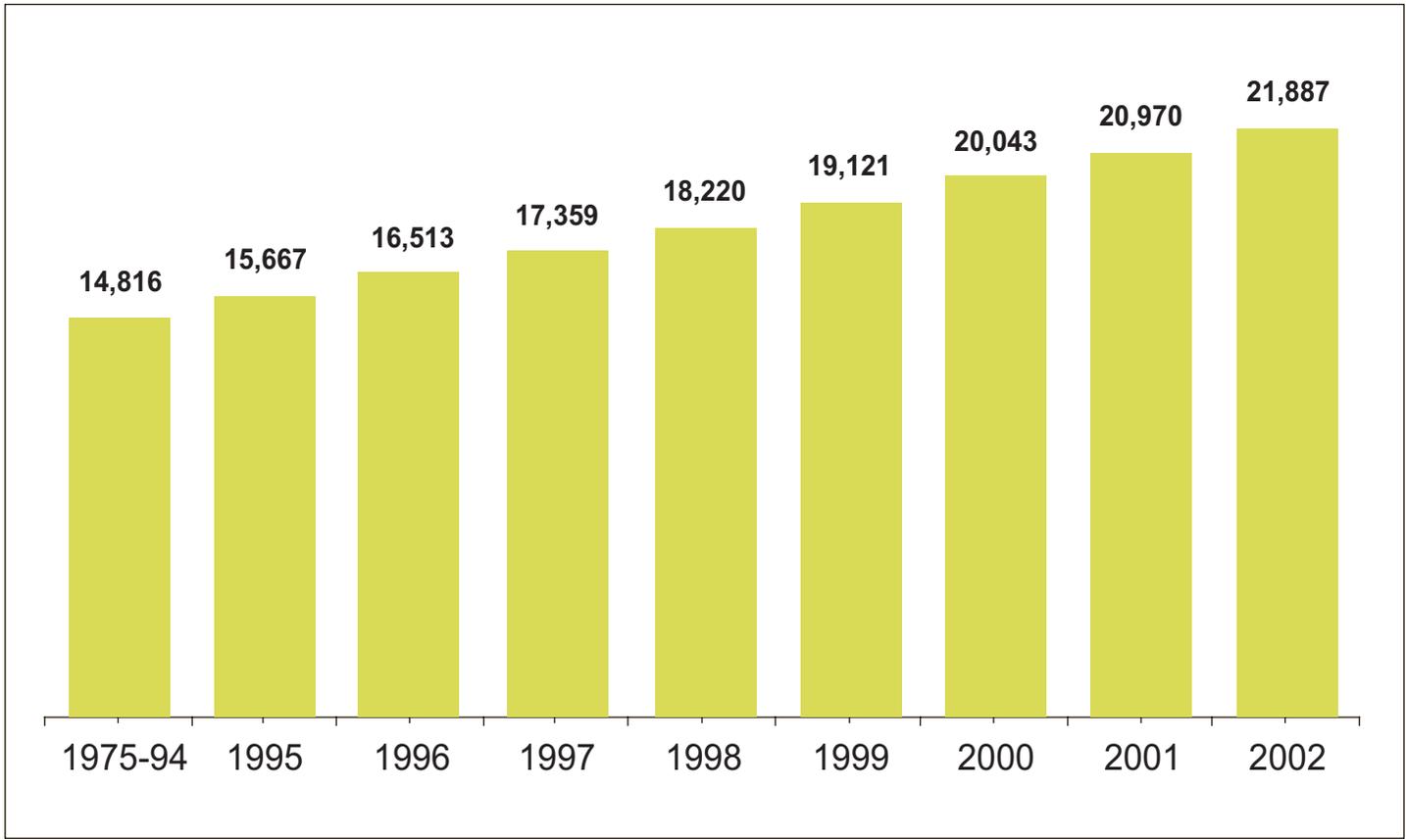
Equivalently, $6,968.02 - 6,062.18 = 905.84 \approx 906$.

Lives Savable

In most lives saved categories, NCSA also produces estimates of the numbers of lives that could have been saved if the safety measure in question had been applied at higher rates. However, the effectiveness rating used in the lives saved by MLDA calculation refers not to alcohol consumption but to the existence of the law itself[1]. Since all 50 states have set their minimum drinking age at 21, the nation is already fully covered by the instrument of effectiveness. Thus estimates of lives savable due to increased coverage are not meaningful, and NCSA does not publish such estimates.

Appendix

Cumulative Estimated Number of Lives Saved by Minimum Legal Drinking Age Laws, 1975-2002[1]

Year	Lives Saved
1975-94	14,816
1995	15,667
1996	16,513
1997	17,359
1998	18,220
1999	19,121
2000	20,043
2001	20,970
2002	21,887

References

1. National Center for Statistics and Analysis, *Traffic Safety Facts 2002 – Alcohol*, NHTSA Fact Sheet, DOT HS 809 606

2. Arnold, R.D., *Effect of Raising the Legal Drinking Age on Driver Involvement in Fatal Crashes: The Experience of Thirteen States*, NHTSA Technical Report, DOT HS 806 902, November 1985

3. Womble, K., *The Impact of Minimum Drinking Age Laws on Fatal Crash Involvements: An Update of the NHTSA Analyses*, NHTSA Technical Report, DOT HS 807 349, January 1989 Revised

4. Glassbrenner, D., *Improving the Calculations of the Lives Saved and Savable by Safety Belts and Air Bags*, NHTSA Technical Report, DOT HS ……, publication pending

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