



Minimum Legal Purchase Age of Alcohol and Highway Safety: Facts and Practices

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Executive Summary

After the repeal of prohibition in 1933, each state was able to choose the minimum legal purchase age (MLPA) for alcoholic beverages that they deemed appropriate. New York State chose the age of 18. By 1975, most states wishing to lower their MLPA had done so. Soon after, concerns were raised that young drivers were over-represented in traffic crashes and fatalities associated with alcohol consumption. Subsequent legislation was established in New York State to increase the MLPA to 19 years of age, as of December, 1982. High alcohol-related crash rates among youths were not limited to New York State; in fact, they were echoed across the nation. Consequently, the federal government passed legislation which encouraged each state to enact a MLPA law of 21 by October, 1986; otherwise, the federal government would withhold a portion of the state's federal highway funds. On December 1, 1985, the MLPA in New York was raised to 21. By mid 1988, all states and the District of Columbia had passed legislation to raise their MLPA to 21, giving rise to a national MLPA.

As part of the project titled "A Decade Later: An Evaluation of the 21 Drinking Age Law," a comprehensive review of the literature was completed in January, 1996 on the history of the MLPA laws and the impact that lowering and raising the MLPA has had on youth alcohol consumption, drinking-driving, and other alcohol-related behaviors. This review was updated in May, 2003. The major findings of this review include:

- The literature has consistently shown that after the MLPA was lowered, there was an increase in youth alcohol-related traffic crashes and fatalities;
- Nationally, there was a 27 percent decrease in the rate of 15- to 20-year-old drivers involved in alcohol-related fatal crashes between 1987 and 1997 (after the MLPA was raised), and MLPA laws have saved approximately 20,970 lives from 1975 to 2001;
- In New York State, from January, 1983 (just after the MLPA was raised to 19) to December of 1994, alcohol-related traffic crashes involving at least one driver under the age of 21 decreased by 75 percent; alcohol-related fatal crashes declined by 75 percent; and alcohol-related injury crashes dropped by 73 percent;
- Raising the MLPA significantly decreased the number of young people drinking in bars

and taverns; however, there have been increases in drinking in private locations;

- In New York State, prior to the late nineteenth century and continuing through to the present, the MLPA laws focused primarily on the purchase and service, but not the consumption, of alcoholic beverages by minors;
- Raising the MLPA assists in preventing teenage alcohol use which in turn reduces alcohol-related problems during the teenage years and possibly later in life. Those who drink less in high school are less likely to be heavy or binge drinkers in college. Data indicated that young adults between 21 and 25 drank less in states with a 21 MLPA;
- Comparison analyses between the 1982 and 1996 New York State Youth Alcohol Surveys indicated that alcohol purchase was down by 70 percent for 19- and 20-year olds in that state, and alcohol use among 18-, 19-, and 20-year olds dropped by up to 47 percent. Self-reported drinking-driving rates were reduced by half for 19- and 20-year olds, and by 84 percent for 18-year olds. Additionally, analyses demonstrated that the rate of parental approval of youthful alcohol use decreased by as much as 50 percent after the enactment of the MLPA law. However, up to 80 percent of underage respondents still reported that their peers would approve of their alcohol use in 1996;
- Raising the MLPA has not affected the amount of alcohol college students consume. Neither the 19 nor the 21 MLPA law decreased New York college students' alcohol consumption rates. Studies of college students performed in other states had similar findings.

While this review clearly shows that the MLPA laws have been effective in reducing youthful alcohol consumption and involvement in alcohol-related traffic crashes, it also indicates several areas where further research is needed. Among these is the need to systematically examine policies and programs directed at alcohol use among college students. While the 21 drinking age has had some impact on college age youths' alcohol-related behaviors, college students in comparison to non-college students are more likely to purchase and drink alcohol, consume higher quantities of alcohol, and acquire more severe safety risks. It is, thus, of paramount importance to develop programs to curtail college drinking and to evaluate the effects of such programs. Efforts should also be made to study the parental role in the enforcement of the MLPA laws; MLPA enforcement programs may need to incorporate parental supervision as a major component. Furthermore, the long-term

effects of the MLPA law in New York State should be further studied and evaluated; findings will provide critical information for policy implementation and strategy formation in reinforcing the MLPA.

1. Background and Introduction

The manner and degree to which society has regulated the purchase, service, and consumption of alcohol have varied throughout history. During colonial times, alcohol consumption was accepted as an integral part of day-to-day life; however, drunkenness was perceived negatively and was sometimes punished. The tavern keeper was respected as a community leader, and the establishment was a common meeting place for most community events. Alcoholic beverages were consumed by nearly everyone and served at almost every occasion (e.g., during business meetings, political meetings, social gatherings and religious ceremonies). Consumption was not exclusive to any particular social or demographic characteristic; it was consumed by the poor as well as the rich, women as well as men, children as well as adults (Frank, Moore, & Ames, 2000; Mosher, 1980).

The laws regarding youthful consumption of alcohol reflected the prevailing atmosphere of acceptance and, to some extent, encouragement. Formal regulation of alcohol distribution was limited and primarily relied on parental and/or employer control. Teenagers were allowed to drink alcohol within their home, and in most states parents had the right to determine whether their child drank outside the home. Neither the child nor the parent was held responsible for the child's consumption of alcohol; instead, the regulations took aim at the distribution of alcohol by tavern owners or innkeepers. Furthermore, the intentions of these laws were not to prohibit the consumption of alcohol by young adolescents, but to govern consumption and prevent intoxication.

The first colonial law regarding youthful alcohol consumption was passed in 1770. It made tavern owners liable if they served alcohol to an adolescent under 16 years of age who then became intoxicated in their establishments. Parents of the drunken teenager were allowed to sue for damages of five pounds. Originally affecting only Ulster and Orange provinces, this regulation was soon extended to several other provinces in the area that would soon be known as the State of New York. In 1773, a new alcoholic beverage law governing taverns was passed, which eliminated all references to adolescents' consumption, and remained in effect until after the beginning of the second quarter of the nineteenth century.

During the nineteenth century, alcohol came to be seen as the source of many

social evils. Taverns, once frequented by all strata of society, were now identified with a lower social status and moral character. Society began to view alcohol consumption as an immoral act, and the Temperance movement became active politically as well as socially. Alcohol-control policies were strengthening, and alcohol consumption was restricted in many areas by local and/or state regulations. For the most part, however, these policies were not directed at youthful consumption, but rather at the purchase and service of alcohol by and to minors. The State was slowly starting to intervene on parental supervision and strengthen its control over the welfare of the child.

At the turn of the nineteenth century, a law was enacted to forbid New York tavern owners from receiving anything of value, presumably in exchange for alcohol, from apprentices and servants. The master could sue for three times the value of whatever the tavern keeper had received. This law was later modified to include children under 14 years of age, thereby entitling the parents to the monetary compensation. In the final quarter of the nineteenth century, a statute was passed to prevent tavern owners from allowing children under 14 from entering their premises, unless escorted by a parent or guardian. This law was amended twice after its original inception; the age was increased to 16 in 1884 and again to 18 in 1896. Shortly after, sales or gifts of alcohol to adolescents were forbidden, but there was still no ban on youthful drinking per se (Mosher, 1980).

The increase in the negative perception of alcohol consumption by the middle class and the wealthy strengthened the support for the Temperance movement during the last quarter of the nineteenth century. Newly created legislation, which was strongly influenced by these two groups, pacified the Temperance advocates. The principles and values of the Temperance movement were promoted in public schools by the establishment of laws which mandated alcohol education. In addition, statutes were imposed to restrict the availability of alcohol, such as reducing the hours in which alcohol could be sold. Surprisingly, the crucial issue of the movement was not alcohol consumption among the youth, but the plight of the children as victims of drunken parents. The perils that alcohol posed on the family were used as the advertising strategy for the crusade. Children were not perceived as violators, but as powerless victims in need of protection (Mosher, 1980).

In 1921, the Temperance movement achieved national success. Alcohol purchase and consumption were prohibited nationwide with the passage of the 18th

Amendment to the Constitution. Only 12 years later, prohibition was repealed. Since 1933, the major legislative focus has been on regulating alcohol consumption of those deemed at high risk for alcohol-related problems, viz., young people, who were considered unlikely to drink responsibly.

All states established minimum legal purchase age (MLPA) laws shortly after Prohibition was repealed. It became illegal for anyone, including parents, to provide alcohol to those under the MLPA. While in most states the MLPA was set at 21, Hawaii and Nebraska set it at 20, and Maine and Vermont at 18. New York established 21 as the MLPA after the Repeal, but lowered it to 18 in May, 1934. In other states, the legislature distinguished among types of alcoholic beverages and allowed youths to purchase beer and/or wine at a younger age than distilled spirits. West Virginia took this approach and established a MLPA of 18 for beer and wine, and 21 for distilled spirits.

Most of these drinking laws were modified several times after the 1930s, and no state currently retains its original statute. In the early 1970s, there was a general movement to lower the minimum age for many government regulated activities. The event that incited these modifications was the passing of the Twenty-Sixth Amendment to the United States Constitution in 1971, which allowed citizens 18, 19, and 20 years of age to vote. With this new adult privilege came a demand for the expansion of other rights and liberties to 18-year-olds, most notably the consumption of alcoholic beverages (Engs and Hanson, 1988). Adding energy to the movement was the argument that 18-, 19-, and 20-year-olds had the adult responsibility of military service yet were not being allowed the adult privilege of consuming alcohol (Douglass, 1980).

As a result of these pressures, more than half (29) of the states in the Union reduced their purchase and consumption ages between 1970 and 1975 (Williams, Zador, Harris, and Karpf, 1983). The MLPA was established at 18 for all alcoholic beverages in 18 of these states. In three other states, the MLPA was lowered to 18 for beer or beer and wine. Six states permitted 19-year-olds to drink all types of alcohol, and Illinois allowed them to drink beer and wine. Delaware limited drinking to those 20 and older (Males, 1986; Mosher, 1980; Wagenaar, 1983a; Wechsler and Sands, 1980). These were the first major modifications made to the MLPA laws since their implementation in the 1930s.

With alcohol and automobiles easily accessible, youths were soon found to be over-represented in highway crashes. Research reported that drinking among high

school students had significantly increased after lowering the MLPA. Studies also showed that adolescent drinking was associated with increases in non-traffic related injuries, risky and anti-social behavior, alcoholism, and other drug use.

In response to these concerns, 28 states raised their MLPA between 1976 and 1984 (Males, 1986). Minnesota led this movement by increasing the MLPA to 19 in 1976 (Asch and Levy, 1987; Coate and Grossman, 1987). Other states soon followed. The Federal Government, moreover, announced the National Minimum Drinking Age Act in July of 1984, which stated that by September 30, 1986, any state that allowed those under 21 to purchase or publicly possess alcohol would lose 10 percent of its federal highway funds. At that time, 18-year-olds had unlimited access to all types of alcoholic beverages in just three states: Hawaii, Louisiana, and Vermont (Bonnie, 1985). By mid 1988, all states and the District of Columbia had established a 21 MLPA, although some kept the de facto MLPA below 21 until 1990 by supplementing the laws with "grandfather" clauses (Laixuthai and Chaloupka, 1993; U.S. Department of Transportation, 1989). New York raised its MLPA to 19 on December 1, 1982, and to 21 on December 31, 1985.

The 1985 New York MLPA law penalized underage persons who fraudulently purchased or attempted to purchase alcohol, or anyone who supplied alcohol to a person under 21. In 1989, the legislature reinforced the existing 21 MLPA law by prohibiting any kind of possession by underage persons, increasing the penalties for illegal alcohol purchase, and allowing confiscation of alcohol in possession of persons under 21.

In addition, since April, 1990, New York driver's licenses for minors have had "under 21 years of age" printed on them. Any persons under 21 who present false identification to purchase alcoholic beverages can receive a fine, a license suspension, and/or community service. An eight-week Alcohol Awareness Program was established by the New York State Office of Alcoholism and Substance Abuse Services in April, 1991 for youths under 21 who violate the 21 MLPA Law and/or Possession Law, or commit an alcohol-related misdemeanor other than a DWAI or DWI. This program was devised to educate participants about the health effects and social costs of alcoholism and alcohol abuse. Supplementary legislation was passed in November, 1991, declaring a driver's license, military ID, or passport to be the only acceptable forms of identification for proof of age to purchase alcoholic beverages. Altering these documents is difficult, thereby reducing illegal alcohol purchase and possession by

minors.

All 50 states and the District of Columbia currently have a youth BAC law, and New York State was the 33rd state to enact a “zero tolerance” law for underage drinking driving in 1996. The New York State zero tolerance law stipulates that it is illegal per se for persons under 21 to drive with a BAC between .02-.07. If a breathalyzer test confirms that the youth’s BAC is between .02 and .07, he or she will be charged with “driving after having consumed alcohol.” The youth is then required to appear before an administrative law judge at a DMV hearing. If the officer proves his or her case, the youth will be convicted of the offense, which remains on the youth’s driving record for three years or until he or she turns 21, whichever is longer. Furthermore, the youth’s license will be suspended for a minimum of six months, and he or she will be required to pay a fine of at least \$125 (Yu & Rizzo, 2000).

Although preliminary results on the effectiveness of the zero tolerance laws have indicated significant decreases in single-vehicle, nighttime fatal crashes (Hingson et al., 1994) and a 19 percent reduction in driving after drinking among youthful drivers (Wagenaar et al., 2001), significant proportions of the underage and parent populations were unaware of the existence of the law. Three years after the enactment of the zero tolerance law in New York State, more than 40 percent of the surveyed parents with at least one underage child and 25 percent of 15- to 18-year olds reported having no knowledge that the state had enacted the law (Yu & Rizzo, 2000).

Like other states, New York has passed new legislation to reinforce the state’s 21 MLPA and drinking-driving laws. Most recently, Sean’s law, which was signed into legislation in September, 2002, stipulates that minors who are charged with alcohol-related traffic offenses will have their driver’s licenses or permits promptly suspended. The law further requires courts to notify parents about their child’s court appearance or the child’s failure to appear in court for a drinking-driving related charge.

2. Arguments for a 21 Purchase Age

2.1 Traffic Safety

Alcohol-related automobile accidents are the leading cause of death for young Americans.¹ Researchers believe this to be the result of a combination of inexperience in driving and inexperience with drinking. Youthful drivers have the highest accident rates of any age group, even for non-alcohol-related accidents. Evidence also shows that lower levels of alcohol affect the driving performance of inexperienced drinkers more than that of experienced drinkers (Burns and Moskowitz, 1977; Pacific Institute for Research and Evaluation, 1999).

It is difficult, however, to directly measure the prevalence of alcohol-related fatalities and crashes. Many minor accidents are not reported to the police. Jurisdictions also vary in the extent to which they measure participants' BAC in accidents or rely on a police officer's subjective determination as to whether alcohol was involved (cf., Zylman, 1975).² Since objective measures of alcohol involvement are available for only a small portion of accidents, comparative studies are difficult to make. Several indirect measures or "surrogates" are, therefore, commonly used to estimate the frequency of alcohol involvement in traffic crashes and fatalities. These measures use rates for types of accidents which research has shown to have a high association with alcohol as a contributing factor.³

One such surrogate measure is the aggregate fatality rate. Approximately half of

¹ Prior to the year 2001, the National Highway Traffic Safety Administration (NHTSA) defined a fatal traffic crash as being alcohol-related if either a driver or a non-occupant had a BAC of 0.01 grams per deciliter or higher in a police-reported traffic crash. Persons with a BAC of 0.10 g/dl or greater involved in fatal crashes were considered to be intoxicated (U.S. Department of Transportation, 1994a). In 2001, NHTSA started to classify alcohol involvement by either a driver or a non-occupant in traffic fatalities using three categories: 0.00 grams per deciliter (no alcohol), 0.01-0.07 g/dl (impaired), or .08+ g/dl (intoxicated) (U.S. Department of Transportation, 2001a).

² The degree of testing for BACs varies among states and affects the accuracy and reliability of the estimates presented. In 1994, the range for known BACs was from a low of just under 11 percent to a high of just over 76 percent. (U.S. Department of Transportation, 1994b).

³ It should be noted, however, that these measures are relatively insensitive. For instance, while nearly two-thirds of single-vehicle nighttime fatal accidents involve alcohol, many alcohol-involved fatal accidents are not single-vehicle nighttime accidents.

all fatally injured drivers have a BAC of .10 or more, according to the data from the 15 states that report BACs (Fell, 1985). The nighttime fatal crash rate is also frequently used as a surrogate measure, as alcohol is involved in 63 percent of nighttime, compared to 18 percent of daytime, fatal crashes (U.S. Department of Transportation, 1994a). Another often used proxy, originally developed at the University of Michigan, is the number of nighttime accidents involving single vehicles driven by young males (Douglass, 1980).⁴ Researchers also use variations of this last proxy to analyze rates for accidents together with one or two of Douglass' three surrogates (e.g., nighttime, single-vehicle crashes).

Some researchers argue that surrogate outcome measures are inferior to more comprehensive ones since they do not allow policy makers to adequately assess the social utility of a higher MLPA. As Cook and Tauchen (1984) state,

[I]n evaluating alternative minimum purchase age legislation, it is desirable to have as comprehensive a measure of the associated social costs as possible. For example, from the evaluation viewpoint, it is more useful to know the effect of MLDA (minimum legal drinking age) change on total fatalities than nighttime fatal crashes.... The Douglass-Wagenaar 'three factor surrogate' - nighttime single-vehicle crashes involving male drivers - is only remotely related to any natural indicator of social costs (p.174-5).

These researchers argue that the MLPA may affect the daytime or multiple-vehicle crash rate as well; therefore, policy makers should be given information on these other outcomes.

Both of these positions have merit. Methodological limitations make indirect measures necessary at times but exclude potentially relevant information. Policy makers need information not only on those individuals most likely to be affected by changes in the MLPA, but also on how such changes will impact the population as a whole. Therefore, when possible, this report will provide information on studies utilizing surrogate indicators as well as on those using more comprehensive indicators.

⁴ Douglass utilized an analytic program entitled "Automatic Interaction Detector" (AID), to select the subset of all driver involvements which, interactively, were most often known to be alcohol-related, to perform an analysis on the data he had from jurisdictions in which there was known relative stability regarding operational measurement. Douglass found that nighttime, single-vehicle, and male driver were the three variables which interactively best predict the driver-crash involvements most likely to be alcohol-related.

2.1.1 Fatalities and Crashes in States with Lowered Purchase Ages

Most early studies on the impact of lowering the MLPA found significant increases in crashes and fatalities. However, they usually either simply looked at traffic statistics before and after the age was lowered or compared states with different ages. Typical of these was the first published study on the impact of lowering the MLPA. Hammond (1973) found fatalities increased in Michigan for 18- to 20-year-old drivers in the year after the MLPA was lowered from 21 to 18, compared to the year before the decrease. Observers in other states noted similar effects (e.g., Orsak, 1983). Hammond (1973) also found an increase of 119 percent for this age group in alcohol-related collisions. The comparable increase for all other drivers was only 14 percent. Hammond's research and other similar studies, however, were considered inconclusive because a change in reporting practices and normal yearly fluctuations could explain the observed effects (cf., Zylman, 1975).

In response to these criticisms, studies in other states controlled for yearly trends, examined data for longer periods of time, and utilized surrogate indicators. These analyses also found significant increases in crashes and fatalities associated with a lowered MLPA. Douglass and Freedman (1980) performed time-series analyses on data collected from 1968 to 1975 from the subset of Michigan jurisdictions in which there was adequate accident reporting. They found a 35 percent increase in police-reported "had-been-drinking" crashes and a 17 percent increase in youthful nighttime male single-vehicle crashes, after the MLPA was lowered from 21 to 18. Similarly, in Virginia, there was an increase in alcohol-related crashes for drivers 16 to 20, after the MLPA for beer was lowered to 18. Drivers 25 and older, on the other hand, experienced a decrease in such crashes during the same four year period (Lynn, 1981).

After Arizona lowered its MLPA from 21 to 19, an interrupted time series analysis was conducted.⁵ It also showed a significant increase in the number of fatal accidents (26 percent) and traffic fatalities (36 percent). There were no significant changes in the number of total traffic accidents or injury-producing accidents. Rates in accident categories associated with alcohol abuse increased while those not linked to alcohol abuse did not; therefore, the study concluded that the lowered MLPA was responsible for the increases (Arizona Department of Public Safety, 1981).

⁵ This study controlled for population changes, the 1973 oil embargo, and the implementation of the 55 mph speed limit in 1974.

Cucchiaro and colleagues (1974) used monthly time series analyses of traffic crash fatalities to examine the impact of reducing the MLPA in Massachusetts. After the age was lowered, 18- to 20-year-old drivers experienced significant increases in total fatal crashes, alcohol-related fatal crashes, and alcohol-related property damage crashes. No significant changes were noted in any of these crash types for older drivers.

Douglass and colleagues (1980) employed a similar research design and methodology. Comparison analysis was performed using three "change" states (states which reduced their MLPA) and three control states (states which kept their MLPA constant).⁶ They found an increased involvement of 18- to 20-year-olds in alcohol-related crashes in two of the three "change" states; no significant changes were demonstrated in any of the three control states for this age group. Neither group of states exhibited any significant changes in alcohol-related crashes in the 21 to 45 age group. A study by the Illinois Department of Transportation (1977) obtained supporting findings; there were more fatalities among 19- and 20-year-olds in states where the MLPA was lowered for beer and wine as compared to those in five control states.

Another study used multiple time-series analyses to examine the proportion of 18- to 20-year-old drivers to the total number of crashes in "change" and control states.⁷ Both nighttime and single-vehicle fatalities in which young drivers were involved increased significantly in the "change" states but not in the control states (Williams et al., 1975).

A study of pooled time-series and cross-sectional state motor vehicle fatality data from the 48 continental states from 1970 to 1977 found that, when relevant factors were controlled⁸, lowering the MLPA for beer from 21 to 18 resulted in an 11 percent increase in the fatality rate for this age group.⁹ There was no change in the fatality rate for older

⁶ The three change states were Maine, Michigan, and Vermont. The three control states were Louisiana, Pennsylvania, and Texas. Changes in alcohol-related collisions were found for Maine and Michigan but not for Vermont. The researchers postulated that the lack of observed effects in Vermont may have been due to the relative ease with which Vermont youth may have been able to obtain alcohol prior to the legal drinking age being lowered by driving to New York, which had a 18-year-old drinking age at the time.

⁷ The change states included Michigan, Wisconsin, and the Canadian province of Ontario. The comparison states were Indiana, Illinois and Minnesota.

⁸ These factors were: The average auto fatality rate before the change, the yearly variability of this rate, the number of years by which the legal age was reduced, and the legal drinking age in "border states."

⁹ This rate reflects the number of people residing in a state, other than pedestrians or bicyclists, killed in motor vehicle traffic accidents.

drivers. Further analysis of the 36 largest states, where 95 percent of the accidents occur, reported an increase of about seven percent. This figure is probably more useful for predicting and evaluating the public health effects of changes in the MLPA, as the youth traffic fatality rate for smaller states is volatile and has a larger error variance (Cook and Tauchen, 1984).

The relationship between a lower MLPA and traffic safety is less clear when cross-sectional analyses are used. One cross-sectional study of national data for the year 1976 found a significantly greater number of single-vehicle fatalities in states with an 18-year-old MLPA than in those with one of 21 (Colón, 1984).¹⁰ However, another national cross-sectional study of single-vehicle fatalities for 1978 found no significant relationship between the MLPA and the overall driver fatality rate, single-vehicle fatality rate, nighttime single-vehicle fatality rate, or male fatality rate.¹¹ This study, instead, reported that drinking experience was significantly related to all fatalities and single-vehicle fatalities, but not to nighttime single-vehicle fatalities (Asch and Levy, 1987).

2.1.2 DWI Arrest Data

Hammond (1973) found a 141 percent increase in DWI arrests in Michigan for 18- to 20-year-olds after the MLPA was lowered from 21 to 18. Roadside surveys also indicated that the proportion of 16- to 20-year-old drivers with BAC's over .05 percent increased from 1.3 percent to 4.9 percent.

2.1.3 Border Crossings

Some argue that it is desirable to have a uniform higher MLPA. Otherwise, youths will drive from a state with a higher MLPA to a contiguous state with a lower age. This redistributes the youth alcohol-related crash rate rather than reduces it. One study testing this theory examined accident rates in the ten New York counties that bordered Pennsylvania. New York's MLPA, at that time, was 18 and Pennsylvania's was 21. The study found the proportion of Pennsylvania drivers under 21 involved in alcohol-related fatal or injury crashes was significantly greater than expected. There was no such significant over-representation of under 21-year-old drivers from the other contiguous states, which also had an 18-year-old MLPA, in alcohol-related crashes in the New York

¹⁰ This study controlled for average mileage driven per licensed driver, metropolitan residents as a percentage of the population, and percentage male drivers.

¹¹ Asch and Levy controlled for a variety of variables frequently used in traffic safety literature: percentage of state highways classified as municipal, average state speed on rural interstates, state average vehicle size, state per capita personal income, percentage licensed state drivers who are male, percentage state licensed drivers 15-24, state alcohol consumption per capita age 14 and above, and minimum legal driving age.

counties that bordered those states (Lillis et al., 1984). An earlier New York study obtained similar results (Negri, 1979).

2.1.4 Self-Reported Drinking-Driving in States with Different Drinking Ages

A 1984-1985 study of college students in states which had not changed their MLPA since 1974 found the MLPA influenced the amount of drinking driving. A significantly smaller proportion (55.6 percent) of students in non-change states drove while drinking compared to students in states with lower MLPA laws (63.0 percent). A higher MLPA made no significant difference, however, in the number of students who drove a car after drinking or who drove a car after knowing they had too much to drink (Engs and Hanson, 1986).

Overall, although the magnitude of the effect may vary according to the measure used and the population examined, it appears conclusive that lowering the MLPA decreased highway safety and increased crash-related costs. Various studies have found that decreasing the MLPA increased youth alcohol-related fatalities (Cucchiaro et al., 1974), youthful nighttime fatal crashes (Williams et al., 1975), single-vehicle youth fatalities (Williams et al., 1975), youth fatalities (Cucchiaro et al., 1974; Hammond, 1973; Orsak, 1983), single-vehicle fatalities (Colón, 1984), and overall accident and traffic fatalities (Arizona Department of Public Safety, 1981). Similarly, there were increases in youth alcohol-related collisions (Hammond, 1973; Lynn, 1981), youth alcohol-related property crashes (Cucchiaro et al., 1974), youthful nighttime single-vehicle male collisions (Douglass and Freedman, 1980), overall alcohol-related collisions (Douglass and Freedman, 1980), and other measures of youthful drinking-driving (Engs and Hanson, 1986; Hammond, 1973).

2.2 Non-Traffic Alcohol-Related Injuries

2.2.1 Hospital Admissions for Alcohol-Related Accidents

Few studies have been conducted on non-traffic alcohol-related accidents. One examined changes in hospital admissions in two Australian states that lowered their MLPA from 21 to 18. Analysis showed a significant increase in admissions for 18- to 20-year-old females in one state, and for 15- to 17-year-old males in the other (Smith, 1986). A study conducted between 1973 and 1983 in Erie County, New York, found that 47 percent of accidental death victims from ages 15 to 24 had some alcohol in their blood, and 23 percent were legally intoxicated (Abel et al., 1984). This work suggests a relationship between the MLPA and adolescent accidents.

2.2.2 Suicides and Alcohol

Other research shows a link between drinking and suicide among young people. One study targeting youths in Allegheny County, Pennsylvania found 46 percent of 10- to 19-year-olds who committed suicide between 1968 and 1983 had a positive BAC at the time of their death (Brent et al., 1987). A similar study in Erie County, New York, reported that, between 1973 and 1983, 35 percent of 15- to 24-year-olds who committed suicide had some alcohol in their blood; 21 percent were legally intoxicated at the time of their death (Abel et al., 1984). Other researchers also have reported a relationship between the MLPA and suicide. In a national study, Jones and colleagues (1992) found the suicide rate from 1979 to 1984 to be 9.7 percent greater among persons who could legally drink than among those of the same age in states where they could not.

2.3 The Relationship Between Alcohol and Other Drugs

The gateway theory stipulates that alcohol may function as a "stepping stone" to other drugs. The National Institute on Drug Abuse conducted a household survey which obtained evidence supporting this view.¹² Researchers found a significant relationship between using alcohol and illegal drugs: Those who used alcohol were much more likely to use illegal drugs. Youths who drank alcohol were 7.5 times more likely to use illegal drugs than youths who never drank. Moreover, an adult who began drinking as an adolescent was also significantly more likely to try illegal drugs and to use them regularly (Center on Addiction and Substance Abuse at Columbia University, 1994).

One recent study that examined the sequence of alcohol and drug usage with a national sample of people between the ages of 12 and 25 showed that youths who smoked cigarettes and used alcohol were more likely to try marijuana than their non-smoking, non-alcohol using counterparts. Furthermore, these youths had a higher

¹² This survey, conducted in 1991, was a national cross-sectional study of children and adults 12 and older with a sample size of over 30,000. Household surveys, in general, are more valid samples of the population than surveys of students, which only provide information on the 85 percent of youth enrolled in school (Johnston et al., 1994). As one would expect, the non-enrolled population differs in many aspects from the enrolled one. Therefore, caution must be used in extending the results of school surveys to youth in general. There are still some limitations to household surveys as a database as they typically provide no information from those in institutions or homeless.

likelihood of continuing their usage of marijuana after the initial occurrence. Similarly, among youths who had an opportunity to sample cocaine, previous marijuana usage led to higher chances of continued cocaine use (Wagner & Anthony, 2002).

Another study on the gateway theory found that the use of alcohol and cigarettes typically preceded the usage of marijuana and other hard drugs (Golub, Labouvie, and Johnson, 2000). These data suggest a sequential pattern of progression from legal drugs (e.g., alcohol and cigarettes) to illegal ones (e.g., marijuana), and that early initiation to drug use increases later usage of drugs (Yu & Williford, 1994).

While school surveys are not a particularly valid source of youth drug use, they nevertheless provide indicators of probable population activities. Several school surveys have been conducted in New York State investigating the relationship between alcohol and other drug use by young people (e.g., Barnes, Welte, and Hoffman, 2002; Kandel and Yamaguchi, 1993; Yamaguchi and Kandel, 1984). Although causality cannot be demonstrated, each shows adolescent alcohol and cigarette use as a precursor of illegal drug use.

Finally, after analyzing the effects of raising the MLPA on alcohol and drug use among high school seniors from 1976 to 1987, O'Malley and Wagenaar (1991) found decreases in marijuana usage associated with increases in the MLPA.

2.4 The Relationship Between Alcohol-Related Acts with High Social and Personal Costs

2.4.1 Criminal Behavior and Youthful Drinking

The exact relationship between problem drinking and youthful criminal behavior is unclear. Studies from a variety of jurisdictions show a correlation between alcohol abuse and a wide range of youthful antisocial behaviors, including delinquency. However, causality has not been established (e.g., Dawkins and Dawkins, 1983; cf., Vingilis, 1981).

An Australian study found a relationship between the MLPA and juvenile crime. Lowering the MLPA to 18 was associated with a more than 20 percent increase in male delinquency. There was no consistently significant relationship between the MLPA and female juvenile crime (Smith and Burvill, 1987). A longitudinal study of delinquent youths in Oregon showed that youths who reported being moderate or heavy drinkers were most likely to commit serious criminal acts. Juveniles who abstained from alcohol tended to commit less serious crimes (Temple and Ladouceur, 1986).

Researchers have found that vandalism arrests and the MLPA appear to be correlated. Reported arrests for vandalism from 1976 to 1981 were studied using two groups of states. The states differed in that one group had a constant MLPA of 18, while the other group raised the MLPA in 1979. There was an average 16 percent decrease in the rate of vandalism arrests in states which raised the MLPA, and an average 1.7 percent increase in the states in which the age remained 18 (NYS DAAA, 1984). Decline in youthful drinking after enactment of MLPA laws notwithstanding, violent crimes by underage drinkers still cost taxpayers 35.9 billion dollars per year across the nation (Levy, Steward, and Wilbur, 1999).

In New York State, several studies have been conducted on the relationship between alcohol and youth crime. A major survey of alcohol use among New York secondary students in 1983 found that five percent reported getting into trouble with the police because of drinking alcohol (Barnes, 1984a). Among New York youths from 12 to 17 in Erie County, those who were heavy drinkers were significantly more likely to report problems with the police because of drinking. Heavy drinkers were also more likely to have committed acts of vandalism, theft, and assault. Overall, controlling for other relevant variables, the amount of alcohol consumed explained 30 percent of the variance of these adolescents' deviant acts; therefore, it was the single best predictor of other problem behaviors (Barnes, 1984b). Other researchers have noted an apparent relationship between raising the MLPA and a decrease in vandalism among New York college students (Lonnstrom, 1984).

2.4.2 Risky Sexual Behaviors and Youthful Drinking

Information collected from a randomly selected sample of Massachusetts teenagers (N=1,773) indicated that youthful alcohol use is linked with unsafe sexual practices. Those consuming an average of five or more drinks a day were almost 2.8 times less likely to report regular condom use than those abstaining from alcohol use (Hingson et al., 1990). Similarly, a recent study showed that drinking increased youths' decisions to have sex but decreased their likelihood of practicing protective behaviors during sex, such as using condoms (Cooper, 2002).

Studies conducted on college campuses have shown that students' heavy drinking leads to such consequences as involvement in date rape, unwanted sexual advances (Wechsler et al., 1994a), and unplanned sexual activity (Wechsler et al., 1995). Moreover, research on colleges in New York State indicated that 29 percent of students did something they later regretted after drinking, 16 percent engaged in unplanned sexual activity, two percent had been the victim of sexual assault, and another two percent had taken sexual advantage of someone else.¹³ Furthermore, heavy episodic drinkers were about ten times more likely to engage in unplanned sexual activity, three times more likely to have been the victim of sexual assault, and twice as likely to have taken advantage of someone sexually, than non-heavy drinkers (Yu & Shacket, 1998).¹⁴

2.5 Age of Initiation and Long-Term Problems

Studies indicate that the age at which a person begins drinking influences how heavily he or she drinks later in life. According to a national survey of high school seniors from 1976 to 1987, those who had legal access to alcohol at 18 were more likely to have a higher rate of drinking as young adults. Those high school seniors who could not legally drink until 21 not only drank less from ages 18 to 20, but also from ages 21 to 25 (O'Malley and Wagenaar, 1991).

A 1986 household survey of New York youths, conducted by the then New York State Divisions of Substance Abuse Services and Alcoholism and Alcohol Abuse, also found a relationship between consuming alcohol at a young age and later alcohol use.

¹³ The study randomly interviewed 813 students from five randomly selected New York State campuses stratified into large, small, public, and private schools.

¹⁴ Heavy episodic drinking is defined in the current document as either males or females who consumed five or more alcoholic drinks in one sitting.

Yu and Williford (1992) reported that alcohol consumption between the ages of 13 and 16 is especially influential in determining how much a person drinks during the remainder of his teenage and young adult years. Other research on adult New Yorkers supports these findings: The earlier the onset of drinking, the more likely those polled were to report current heavy drinking. This relationship remained constant for all age groups (Barnes and Welte, 1988).

A study of New York college students also found a relationship between the age at which respondents began drinking alcohol and how heavily they drank.¹⁵ Those who began drinking at younger ages were more likely to drink heavily in college. Students who began drinking at a younger age were also more likely to report such alcohol-related problems as having trouble at work, with friends, family members, and police. In addition, these respondents tended to report driving after drinking or having an alcohol-related accident at home or in a car (Barnes, Welte, and Dintcheff, 1992). Other research indicated that those who drink less in high school are less likely to be heavy or binge drinkers in college (Harford, Wechsler, and Muthen, 2002; Humphrey and Friedman, 1986; Wechsler et al., 1994b; Yu and Shacket, 2001).¹⁶ Some studies noted a significant association between pre-high school alcohol use and alcohol-related problems while in college (Gonzalez, 1989).

The early onset of drinking appears to be strongly related to the frequency of alcohol problems, as well as the development of alcohol and other substance abuse disorders. Brown and D'Amico (2001) reported that 40 percent of people who began drinking at age 14 or earlier eventually became alcohol dependent later in life. Relative to people who began drinking at age 20 or older, those who began drinking at earlier ages were four times more likely to subsequently become alcohol dependent.

2.6 *Spill-Over Effects of Allowing Those 18 to 20 to Drink*

Some say that allowing 18- to 20-year-olds to drink facilitates access to alcohol for those under 18, as the primary source of alcohol for the latter is likely to be older

¹⁵ 1,934 adults ages 18 to 25 who lived in the general population or in dormitories of two- and four-year colleges in New York State were selected for this sample.

¹⁶ The term binge drinking, if not otherwise indicated in the current document, is defined as drinking five or more alcoholic drinks in one sitting for males and four or more alcoholic drinks in one sitting for females (see Wechsler et al., 1995).

friends and acquaintances who have access to alcohol. Therefore, an 18-year-old MLPA results in those 18-year-olds who are still in high school supplying alcohol to their younger classmates. The behavior of the 18-year-olds is particularly influential to those 17, 16, and even 15, since youths typically imitate the practices of those slightly older than they are, rather than the practices of those substantially older (Bonnie, 1980).

Empirical work seems to support this theory. In the *1978 National Study of Adolescent Drinking Behavior*, students in the 10th, 11th, and 12th grades were surveyed.¹⁷ Those in states with a 21 MLPA were significantly more likely to abstain. Students consumed the highest average amount in states which allowed youths under 21 to drink all types of alcohol and the least amount in states in which they were not allowed to drink at all. In states with a lower MLPA, students drank significantly more, were less likely to abstain from alcohol, and were drunk more often. Respondents in states with a 21-year-old MLPA were significantly less likely to drive around at night while drinking, and were the least likely to report driving after having a lot to drink (Maisto and Rachal, 1980).

Analyses of another national survey, *Monitoring the Future*, conducted by the University of Michigan, reported a significant negative relationship between the MLPA and high school senior drinking behavior. Students in states with a lower age drank more frequently and were more likely to be heavy drinkers (Laixuthai and Chaloupka, 1993). Seniors in these states reported a 5.6 percent higher overall average alcohol use. These findings remained significant after controlling for a variety of other relevant socio-economic variables (O'Malley and Wagenaar, 1991).

¹⁷ This study surveyed students from 74 randomly selected schools, located in the 48 contiguous states.

3. Arguments Against a 21 Purchase Age

3.1 *Philosophical Arguments*

Some argue that irrespective of the possible personal and societal benefits of raising the MLPA to 21, there are philosophical reasons to allow those under 21 to drink alcohol. One of the strongest arguments for allowing those under age-21 to drink is that youths are treated as adults in most other respects. They are able to join the military and serve overseas. In most states, they can marry without parental consent and are presumed capable of regulating other aspects of their own sexuality. Youths were given the right to vote in federal elections in 1971 and receive full civil rights in most jurisdictions. It is, thus, inconsistent to extend the privilege in these areas but not allow those under 21 to consume alcohol legally (Douglass, 1980; for a review, see Wagenaar and Toomey, 2002). A higher MLPA may increase the extent to which young people are marginalized and alienated from society (Newman, 1987), whereas allowing them to consume alcohol legally in a controlled and supervised setting would permit youths to learn to drink responsibly and prepare them for adult status (Wagenaar, 1983a; for a review, see Wagenaar and Toomey, 2002).

It is unfair, according to another argument, to sacrifice the rights of the majority of youths who drink responsibly because of the actions of those who do not. Crash statistics show that only about 1 percent of all 19- and 20-year-old drivers are involved in fatal or serious alcohol-related crashes. Therefore, by setting the MLPA at 21, society is unjustly punishing the 99 percent responsible drinkers in this age group.

Arguments on the constitutionality of MLPA continued into the latter half of the 1990s. The 21 MLPA law was challenged in the Louisiana Supreme Court in 1996 on the basis that it violated the state's constitution regarding age discrimination. The Court ruled that because the 21 MLPA had been empirically shown to improve highway safety, it was not an arbitrary law and therefore did not violate Louisiana's constitution (Manuel vs. Sate of Louisiana, 1996).

3.2 *Utilitarian Arguments*

Some argue that restricting alcohol consumption will increase, rather than decrease, its use in the target population; its very restriction enhances its desirability and makes consuming alcohol a daring and exciting activity (Allen, Sprenkel and Vitale, 1994). One researcher claims that students stockpile an excessive supply of alcoholic beverages for consumption over the span of a weekend, fearing they will run out of alcohol. Their intention is to drink what they have paid for, which leads to an increase in consumption (Zimmer, 1995). On the other hand, removing the controls on alcohol would make it no different than drinking any other beverage (cf., Vingilis and De Genova, 1984).

Others argue that those 18 to 21 will drink regardless of the legality of their action as consuming alcohol is seen as a rite of passage to adulthood. Therefore, society should allow the members of this age group to drink alcohol; otherwise they will become accustomed to violating the law and more likely to disregard other laws. In addition, youths may circumvent the law by finding other people who will provide them with alcohol. In doing so, they will be associating with those who are willing to break the law. Thus, raising the MLPA will increase the association of youths who wish to drink with those who are deviant. It will also expose them to perspectives that are favorable to disregarding the law (Lanza-Kaduse and Richards, 1989).

Increasing the MLPA, according to others, merely postpones the problems associated with beginning drinkers. The proponents of this viewpoint argue that new drinkers will inevitably drive unsafely. Therefore, the primary outcome of an increased MLPA is a redistribution of traffic accidents and fatalities among age groups (Males, 1986; Asch and Levy, 1987).

Some claim that the MLPA laws force young adults to experiment with alcohol in the company of other young adults; therefore, it promotes irresponsible use of alcohol because young adults are not exposed to the positive or negative social cues from parents or adults (Zimmer, 1995).

4. Questions to be Answered in Assessing the Effects of Raising the Minimum Legal Purchase Age

4.1 Is the Legal Purchase Age Being Enforced Effectively?

Although the minimum purchase age across the U.S. is currently 21, many underage youths still find a way to obtain and drink alcohol at licensed alcohol establishments, such as at bars, restaurants, and liquor stores. Studies have shown that minors can purchase alcohol without age identification in about half of their purchase attempts (Forster et al., 1995). Minors often do not have to even purchase their own alcohol since parents, siblings, legal-aged friends, co-workers, and strangers may purchase the alcohol legally and then illegally provide it to the minors (Wagenaar, 2000).

Research indicates that enforcement of the MLPA varies greatly from state to state and across counties, but, overall, only an estimated two of every 1,000 occasions of underage drinking result in an arrest (Wagenaar & Wolfson, 1994).¹⁸ Wagenaar and Wolfson (1994) further showed that when an arrest is made, the enforcement is typically aimed at the underage drinker rather than the commercial outlet or private person who supplied the alcohol to the youth; in fact, for every 1,000 arrests of 16-20 year olds for underage drinking, 130 alcohol outlets are charged for selling to a minor, and only 88 adults (ages 21 and older) are arrested for purchasing alcohol for a minor.

Reviewing MLPA enforcement actions in 295 counties in Kentucky, Michigan, Montana, and Oregon between 1988 and 1990, Wagenaar and Wolfson (1995) reported that 27 percent of the counties took no legal action against licensed establishments that sold alcohol to minors, and 41 percent of those counties did not take legal action against adults who purchased alcohol for minors.

4.2 Does a Higher Legal Purchase Age Improve Traffic Safety?

There have been numerous studies which have attempted to determine if raising

¹⁸ These data were obtained by examining FBI files for criminal and administrative enforcement actions against underage drinking between the years of 1988 and 1990 and used the 1990 U.S. Government Census of Population report to generate the rates.

the MLPA improves highway safety. Researchers have approached the question in a variety of ways. While, for the methodological reasons discussed earlier in this report, their research designs and consequently their results have varied, they have for the most part found that raising the MLPA improves highway safety (see Wagenaar and Toomey, 2002).

4.2.1 The Effect in Other States

Increasing the MLPA has a significant effect on those 18 through 20, according to a time series analysis of motor vehicle accident mortality data across the 48 contiguous states.¹⁹ If the MLPA is increased from 18 to 21, these analyses predict an 18 percent reduction in mortality for the affected age group. This analysis found no effect for youths ages 15 through 17 or for those ages 21 through 24 (Coate and Grossman, 1987; Saffer and Grossman, 1987a;1987b).

Other studies support these findings. The Insurance Institute for Highway Safety conducted a study of 26 states which raised the MLPA. It found that from 1975 to 1984, affected drivers experienced a 13 percent reduction in fatal crash involvement (Du Mouchel et al., 1987). O'Malley and Wagenaar (1991) examined 13 states for which there were data for three years before and three years after a change in the MLPA.²⁰ Significant declines were noted in the yearly aggregate fatality rate for drivers affected by the change. No such changes were observed for older drivers.

Extensive research by Williams et al. (1981; 1983) examined the nine states which raised their MLPA between 1976 and 1980. Researchers compared the change in proportions of fatalities for affected drivers in these "change" states to the change for

¹⁹ This study utilized data from 1975 through 1981. It controlled for vehicle miles traveled, percentage of youth with a drivers license, motor vehicle inspection, border states with a lower drinking age, monetary variables, and "drinking sentiment" variables.

²⁰ The 13 states were Delaware, Florida, Georgia, Illinois, Maryland, Massachusetts, Michigan, Nebraska, New Jersey, Ohio, Oklahoma, Tennessee and Texas.

drivers in "comparison" states in which the MLPA was not raised.²¹ They also compared the change in proportions in several surrogate categories to the change in non-surrogate categories. Results were consistent for each: In the states which raised the MLPA, there were reductions in fatalities and reductions in categories where alcohol was likely to be involved among affected age groups.

An estimated 30 percent fewer drivers were involved in nighttime fatal crashes in the "change" states than in "comparison" states. The "change" states also had an average 28 percent net reduction in nighttime fatal crashes for drivers in the age groups to whom the law change applied, compared to older drivers in the same state.²² There were significantly greater decreases in the affected age groups for single-vehicle nighttime fatal crashes in the "change" states than in the "comparison" states. In the "change" states, 41 percent fewer drivers were in single-vehicle nighttime fatal crashes than in the "comparison" states (Williams et al., 1981; 1983).

In sum, five multiple-state studies found a significant relationship between raising the MLPA and traffic safety. Analyses of individual states are less consistent in their findings. But in most, the relationship between a higher MLPA and highway safety is clear: Increasing the MLPA lessens fatalities, injuries, and property damage.

Several related studies utilizing time series analysis were conducted on Michigan data. One study, using a 20 percent random sample of data from 1972 to 1979, found a 31 percent decrease in police-reported alcohol-related crashes among 18- to 20-year-olds following the 1978 increase of Michigan's MLPA to 21.²³ There was a slight increase for drivers ages 21 to 24 and for those ages 25 to 45. No significant change appeared in the number of non-alcohol-related crashes, in the same time period, for any age group. This study also examined single-vehicle nighttime male crashes to discern if the apparent effect of increasing the MLPA might be an artifact of changes in police reporting practices or other unrelated factors. The results suggest that the 21 MLPA had a significant effect, in that 18 percent fewer young men in Michigan were involved in

²¹ The "change" states were Illinois, Iowa, Maine, Massachusetts, Michigan, Minnesota, New Hampshire, and Tennessee. The "comparison" states were Indiana, Kansas, Vermont, Connecticut, Ohio, Wisconsin, Idaho, sixteen central and northern counties in New York, and Kentucky.

²² These reductions ranged from 6 to 75 percent and occurred in every state studied but Montana.

²³ Employing a multiple time series analysis, the study controlled for long-term trends, seasonal cycles, the fuel shortage, the decrease in the speed limit and other factors affecting crash frequencies to determine the extent the expected differed from the actual ones.

nighttime single-vehicle crashes after the MLPA was raised. There were no significant decreases in male, single-vehicle nighttime accidents for drivers ages 21 to 24 or ages 25 to 45. Thus, in the first 12 months after the MLPA was raised, there were approximately 1650 fewer crashes in Michigan than would have been expected had there been no MLPA change (Wagenaar, 1981).

An analysis of the full Michigan data set for the same period obtained approximately the same results; police-reported alcohol-related accidents among 18- to 20-year-olds decreased 28 percent after the MLPA was raised to 21. This analysis also revealed a 22 percent decrease in single-vehicle nighttime male accidents. However, since there was also an 11 percent decrease in daytime accidents, one, according to the researchers, should only accept 11 percent of the decrease as the result of raising the MLPA (Wagenaar, 1983a; Wagenaar et al., 1981).

A related study of Michigan data reported a relationship between the MLPA and alcohol-related property damage crashes. Those in the affected age group were significantly less likely to be in property damaging alcohol-related crashes after the age was raised. Affected youths experienced no significant changes in non-alcohol-related property damage crashes. Adults older than 21 had no such changes nor did youths or adults in New York, which was used as a "comparison" state in this study. While 16- and 17-year-olds had significant decreases in their alcohol-related property crash rates, they also experienced similar declines in non-alcohol-related property crash rates; thus, factors other than changing the MLPA may have been responsible for the changes for this age group (Wagenaar et al., 1981).

Michigan data collected between 1976 and 1984 were further examined for changes in the rate of "had been drinking" injury-producing crashes over the six years following the initiation of a higher MLPA. Wagenaar (1986) found a statistically significant decrease of six percent among 18- to 20-year-olds. Conversely, an increase of 13 percent was demonstrated among the 21 and older age group. Also examined was the effect of the raised MLPA on single-vehicle nighttime crashes. He discovered that among drivers 18- to 20-years-old, no change had occurred; however, the 21 and older drivers had experienced a significant 17 percent increase.

When Wagenaar and Maybee (1986) examined data from Texas, they found a significant decrease in injuries obtained from single-vehicle nighttime crashes involving 18-year-olds, after the MLPA was raised from 18 to 19; no such decreases were found

for drivers 21 or older. There was also a significant decrease in property damage caused by motor vehicle crashes by drivers in the affected age group.

Unlike in Michigan and Texas, raising the MLPA in Maine did not significantly reduce the incidence of police-reported alcohol-related injury-producing crashes for the affected age group.²⁴ Although statistically insignificant, there was a decrease of 18 percent in single-vehicle nighttime crashes involving male drivers, 18- and 19-years old. However, an increase was reported in daytime injury and fatal crashes among 18- and 19-year-olds. Researchers speculate that these results may actually indicate that there would have been an increase in single-vehicle nighttime male crashes if the MLPA had not been raised.

Maine alcohol-related property damage crashes involving 18- and 19-year-olds were significantly reduced by 17 percent. As in other studies, there were no significant increases in alcohol or non-alcohol-related property damage crashes for older drivers. Additional analysis of single-vehicle nighttime male property damage crashes showed a 21.5 percent decrease in the twelve months after the MLPA was raised. There was no corresponding change in daytime property damage crashes, in single-vehicle nighttime older male property damage crashes, or in comparison with New York drivers whose MLPA remained the same (Wagenaar et al., 1981; Wagenaar, 1983a; 1983b).

Affected drivers were compared to young drivers not affected by the law change in a state by state analysis of fatal crash involvement in 13 of the 15 states which raised their MLPA between 1975 and 1982.²⁵ This analysis also obtained mixed and inconsistent findings. However, pooling the data produced an overall average reduction of about 13 percent (Arnold, 1985). An updated study of the same 13 states was conducted on pooled fatal crash data collected through 1986, or until a second MLPA

²⁴ This study utilized time series analysis and controlled for long-term and seasonal trends and other factors.

²⁵ The 13 states were Florida, Georgia, Illinois, Iowa, Maine, Michigan, Minnesota, Montana, Nebraska, New Hampshire, New Jersey, Tennessee, and Texas. The two other states, Massachusetts and Rhode Island, which also had a drinking age change during this period, were excluded from the analysis for methodological reasons.

change was made in a state. The results showed an estimated 12 percent reduction for the affected age group (Womble, 1989).

Fatal crash data from 1976 to 1981 were examined for Massachusetts, which raised its MLPA from 18 to 20, and New York,²⁶ which retained an 18-year-old MLPA. This study found no significantly different trends for 16- and 17-year-olds between the two states. There was, however, a 15 percent decrease in traffic fatalities among 18- and 19-year-old youths in Massachusetts, and a 16 percent increase for the same age group in New York. The same study found a significant decrease in the number of single-vehicle nighttime fatal crashes involving 18- and 19-year-olds in Massachusetts but not for those in New York. There was no significant difference between Massachusetts and New York in the frequency of self-reported non-fatal teenage crashes for those 16 to 19 years old (Hingson et al., 1983).

Another multi-state study also yielded mixed results. Time series analysis of Massachusetts' monthly traffic fatalities from 1975 to 1981 found insignificant changes in youth fatalities compared to older drivers and to youths of the same age in Connecticut, a control state. The same study, however, reported significant changes in Michigan and Illinois for the young driver fatality rate in comparison to older drivers within each state and to young drivers in control states (MacKinnon and Woodward, 1986).

Studying the effects of altering the MLPA, Males' (1986) analyses showed that raising the MLPA to 21 had an overall adverse effect on highway safety. He concluded that a net increase in fatal crashes combined with a small decrease in the old "beginning drinker" age group was outweighed by a larger increase in the new "beginning drinker" age group. Males concluded that the apparent effects of raising the MLPA may be more accurately attributed to short term effects, factors specific to particular states, and other trends in driving behavior (such as the 1974 national speed limit reduction). Males' analyses, nevertheless, was criticized for methodological weaknesses (cf., Williams, 1986).

²⁶ New York was selected as a comparison state for a number of reasons. Not only are the two states contiguous but they also have similar drivers licensing and drunk driving laws. In addition the two states also have similar weather patterns. Data from New York City and Nassau County were excluded from this study because of differences in urban density and licensing for young drivers.

Inconsistencies were noted in regards to self-reported drinking-driving behavior. Research comparing youths in Massachusetts, which raised the MLPA, to those in New York, which did not, found Massachusetts youths were less likely to report drinking-driving, but equally as likely to drink heavily and drive. In New York, youths did not change their drinking-driving practices (Hingson et al., 1983; Smith et al., 1984).²⁷

Studies of college students show that raising the MLPA has little effect on self-reported drinking-driving. Nine months after Florida raised its MLPA from 19 to 21, those 19-year-old university students who were able to continue to drink alcohol through a "grandfather" clause reported no significantly different drinking-driving practices than those who were unable to legally drink alcohol (Lanza-Kaduse and Richards, 1989). No significant decreases in self-reported drinking-driving were noted among Arizona State University students after an increase in their state's MLPA (Williams et al., 1990).

4.2.2 The Effect in New York State

While other individual states' experience may vary, a higher MLPA clearly has saved lives and improved traffic safety in New York. In 1982, the year before the MLPA was raised to 19, a total of 694 fatal crashes occurred in New York, in which the investigating police agency designated alcohol as a contributing factor for at least one driver. In 1983, the year after the change, there were 627 such fatal crashes, a 9.65 percent decrease (Lillis et al., 1987). In 1994, there were only 380 fatal crashes in New York in which a driver or non-occupant had a measurable BAC of .10 or greater (U.S.

²⁷ Neither Massachusetts nor New York require non-fatal accidents to be reported to the police. To determine if the analyses were confounded by Massachusetts youth crossing the border into New York to drink and then having alcohol-related accidents in New York, the data were examined excluding border counties. No significantly different results were obtained.

Department of Transportation, 1994b). In 2001, the number of fatal crashes in New York State involving a legally intoxicated driver was 307 (U.S. Department of Transportation, 2001b).²⁸

Comparing the number of alcohol-related injury crashes in New York for the year before (1982), and the year after (1983) the MLPA was raised to 19, Lillis and colleagues (1987) reported a 5.6 percent reduction for the driving population. The three years following the MLPA increase exhibited an annual average of 64 fewer people killed in alcohol-related accidents involving at least one driver under the age of 21, a decrease of 29 percent.

From 1982 to 1994, there was a 79 percent decrease in both alcohol-related crashes and alcohol-related fatal crashes involving at least one driver under the age of 21. This represents 2,626 fewer alcohol-related crashes. During this same time period, the total crashes decreased by almost 29 percent for this age group (New York State Department of Motor Vehicles, Research and Evaluation, 1994). Comparison analysis between 1986, when the MLPA was further raised to 21, and 1994, demonstrated a 65 percent decrease in alcohol-related fatal crashes involving at least one driver under the age of 21. These figures suggest that raising the MLPA had a strong effect on fatalities in the affected age group in New York.

²⁸ In 1998, the federal government called for the national legal BAC limit to be lowered from .10 to .08, and many states followed through with this recommendation in the ensuing years. In 2001, NHTSA started reporting annual statistics on alcohol-related traffic fatalities for all states using the .08 limit regardless of whether states had adopted the .08 law or not. Currently, 39 states and the District of Columbia have implemented .08 BAC per se laws.

Furthermore, after the MLPA was raised from 18 to 19, the New York State Police reported a decrease in the arrest rate for non-crash DWIs for the affected age group.²⁹ The analysis revealed an 18 percent decrease for 17-year-old drivers, a 34.9 percent decrease for 18-year-old drivers, and a 20 percent decrease for 19-year-old drivers (Lillis et al., 1987).

Prior to changing the MLPA from 18 to 19, 18-year-olds did not significantly differ from 19-year-olds in their reported drinking-driving. After the MLPA was increased to 19, the Youth Alcohol Study, a household survey of 16 to 20-year-old New Yorkers,³⁰ found that 18-year-olds were significantly less likely to drive while feeling the effects of alcohol than previously disclosed. For this cohort, males reported a 50 percent decrease in drinking-driving and females reported a decrease of 38 percent. Although other age groups also reported less drinking-driving, the decrease was greatest for 18-year-olds (Lillis et al., 1987).

Increasing the MLPA has obviously improved traffic safety in New York. There are fewer total crashes and fatal crashes in which alcohol is a contributing factor, and fewer young people are involved or killed in alcohol-related accidents. Moreover, after the MLPA was increased, self-reported drinking driving and DWI arrests decreased for affected youths.

4.2.3 The Effect Nationally

The evidence is also conclusive that highway safety has improved nationwide since the MLPA was raised. Alcohol is involved in fewer fatal traffic crashes than it was before 21 was established as the "national purchase age." From 1984 to 1994, there was a 30 percent decrease nationwide in the fatal crash rate in which at least one person involved in the crash was intoxicated. During the same time period, there was a 29 percent decrease in the percentage of intoxicated drivers involved in fatal crashes and a 17 percent decrease in the rate of single-vehicle crashes in which the intoxicated driver was killed. There was also an 18 percent decrease in the percentage of

²⁹ The New York State Police make approximately 25-30 percent of DWI arrests each year.

³⁰ This survey was primarily designed to determine the relationship between purchase age policy, alcohol-involved highway crashes, drinking, and drinking-driving behaviors. It thus excluded those living in New York City because previous research indicated an extremely low incidence of alcohol-involved crashes, motor vehicle licensing, driving, and drinking and driving in New York City among this age group. This project was funded by the New York State Governor's Traffic Safety Committee.

intoxicated drivers killed at nighttime and a decrease of 10 percent in the rate of nighttime single-vehicle fatalities in which the driver was intoxicated (U. S. Department of Transportation, 1994a).

Furthermore, the rate of 15- to 20-year-old drivers involved in alcohol-related fatal crashes decreased by 27 percent between 1987 and 1997 (U.S. Department of Transportation, 1997). NHTSA has further estimated that raising the MLPA to age 21 has prevented more than 20,970 crash fatalities among youths from 1975 to 2001; in 2001 alone, an estimated 927 lives were saved by the MLPA laws (U.S. Department of Transportation, 2001c).

4.3 Does a Higher Purchase Age Decrease Youth Alcohol Consumption?

Most studies have found that raising the MLPA significantly affects the quantity of alcohol those under 21 consume. An analysis of responses from persons 16 to 21 years old questioned by the *National Health and Nutrition Examination Survey* found they drank less frequently in states with a higher MLPA.³¹ This was especially true for those who were heavier drinkers (Coate and Grossman, 1987; 1988). The *Monitoring the Future* project also found high school senior alcohol use decreased significantly in states which increased their MLPA.³² Raising the MLPA from 18 to 19, 20 or 21 was associated with a 13 percent decrease in the amount of alcohol that seniors reported drinking in the 30 days preceding the survey. The majority of this decrease took place in the first year the law was changed, with slight additional decreases in the following two years (O'Malley and Wagenaar, 1991).

³¹ This was a national cross-section household survey of approximately 21,000 persons between the ages of 12 and 74, conducted by the National Center for Health Statistics between May 1971 and June 1974 and between February 1976 and February 1980.

³² The Monitoring the Future project is a national probability survey of high school seniors. This analysis examined data from 1976-1987.

Recent studies have demonstrated that a higher minimum legal drinking age leads to lowered alcohol use. One study showed that high school seniors in the year 1980 (several years before the MLPA was raised to age 21 in all states) were 13 percent more likely to report drinking in the year before the survey compared to students surveyed in 1997 (88 percent versus 75 percent). Additionally, the proportion of students who reported drinking five or more drinks in one sitting dropped from 41 to 31 percent (Johnston et al., 1998).

Before the MLPA was increased to 19 in New York, 18- to 20-year-olds had similar drinking patterns. In the year after the law was changed, self-reported drinking decreased for 18-year-olds at all prevalence levels but not for 19- or 20-year-olds, according to those surveyed in the Youth Alcohol Survey. Alcohol consumption remained significantly lower for 18-year-olds than for 19- and 20-year-olds through 1985. Adolescents 16 to 18 questioned in 1982, 1983, and 1985 also reported lower prevalence levels after the MLPA was raised to 19 (Williams and Lillis, 1986;1988). In a 1986 survey of adult New Yorkers, Barnes and Welte (1988) noted that after the MLPA was raised, 18- to 20-year-olds had lower rates of drinking and heavy drinking than those 21- to 34-years-old, whereas the younger group had higher rates before the increase.

In a recent study, Yu and his colleagues (1997) reported large reductions in drinking and drinking-driving practices by the underage groups in New York State. For instance, between 1982 and 1996, alcohol purchase was down by 70 percent for 19- and 20-year olds. Furthermore, the rate of alcohol consumption in general was reduced by about 26 percent for 16- and 17-year olds, 47 percent for 18-year olds, and 33 percent for 19- and 20-year olds. Drinking-driving activities by 16- and 17-year-olds were less than five percent, and the prevalence of drinking driving between 1982 and 1996 dropped 84 percent for 18-year-olds, 51 percent for 19-year-olds, and 46 percent for 20-year-olds. Parental approval of underage drinking decreased significantly; for example, the approval rate among parents for alcohol use by 18-year-olds decreased by more than 50 percent between 1982 and 1996. However, the approval rate of underage drinking by peers remained almost unchanged during the same time period. These findings raise questions regarding the enforcement of the MLPA law. Parental guidance seems to be an important factor for the reductions in the alcohol-related behaviors among the underage groups.

Other studies support the premise that a higher MLPA decreases the amount of alcohol New York youths consumed. Two large representative samples of 7th to 12th graders, from randomly selected New York public and private schools, were surveyed in 1983 and 1990 regarding their use of alcohol. Fewer students in the second sample drank alcohol, 60 percent compared to 71 percent. They also were less likely to drink heavily, 9 percent compared to 13 percent. When gender and ethnicity were examined separately, the findings remained the same; drinking and heavy drinking decreased or remained the same for all sub-groups after the MLPA was raised (Barnes, Welte, and Dintcheff, 1993).

Household surveys of Massachusetts and New York youths were taken immediately prior to Massachusetts raising its MLPA from 18 to 20, and again one and two years later. These studies found no significant differences between Massachusetts' and New York's 16- to 19-year-olds in the amount of alcohol they consumed or in the proportion who abstained. These findings, however, may be attributable to the relative ease with which Massachusetts' youths could obtain alcohol in other bordering states, which had lower MLPA laws at that time (Hingson et al., 1983).

A great deal of the research on the effects of raising the MLPA on youth alcohol consumption have used college students as subjects. Studies have shown that college students drink more than their non-college enrolled counterparts (Crowley, 1991; Johnston et al., 1989; O'Malley & Johnston, 2002), differ in their consumption patterns (Crowley, 1991; Johnston et al., 1994), and experience alcohol problems as a consequence. For example, research has indicated that up to 18 percent of college students could be classified as alcohol dependent (Yu and Shacket, 2001); 1,400 college students die every year due to heavy drinking, and another 500,000 students suffer physical injuries while intoxicated (Task Force of the National Advisory Council on Alcohol Abuse and Alcoholism, 2002).

Several studies have been conducted on New York college students. In one, researchers collected data from undergraduates at a public university 9.5 months before, 2.5 months after, and 14.5 months after the state MLPA was raised from 19 to 21. They found the 21 MLPA law did not change the abstention rates or the number of drinks per week of 19- to 20-year-olds (George et al., 1989). Other studies of New York college students analyzing the impact of raising the MLPA from 18 to 19 reported similar findings: the 19-year-old MLPA did not affect alcohol consumption rates for 18-year-old

college students (Perkins and Berkowitz, 1989). Studies conducted outside of New York support these findings: Raising the MLPA has not significantly decreased consumption for college students (Engs and Hanson, 1985; George et al., 1989; Gonzales, 1990; Hughes and Dodder, 1992; Lanza-Kaduse and Richards, 1989; O'Hare, 1990; Williams et al., 1990).

Unfortunately, research on college drinking tends to have limited significance as it is often based on convenience samples (e.g., George et al., 1989; Gonzales, 1990; Hughes and Dodder, 1992) or are restricted to data gathered from students in social science classes (e.g., George et al., 1989; Hughes and Dodder, 1992) or in one university or college in a state (e.g., O'Hare, 1990; Perkins and Berkowitz, 1989; Williams et al., 1990).

Researchers have also analyzed non-survey data to determine if raising the MLPA affected youth alcohol consumption. Some studies examined alcohol sales data on the premise that they reflect changes in consumption amounts. One study looked at distilled spirits sales over 25 years from all 48 contiguous states. It found that after controlling for legal, regulatory, price, and socio-cultural variables, MLPA laws had no consistent statistically significant effect (Hoadley, Fuchs, and Holder, 1984).

Other researchers have suggested that beer sales are a more appropriate measure of teenage alcohol consumption, as most youths drink beer, rather than wine or distilled spirits. Two studies examined the relationship between beer sales and the MLPA. Both suggest that raising the MLPA is associated with decreased beer sales. One of the studies, conducted in Michigan, found that there were significant decreases in package beer sales, but also significant increases in draft beer sales after the MLPA was raised from 18 to 21. It is unclear, however, if the higher MLPA or the simultaneous imposition of a beverage container deposit law was responsible for these changes (Wagenaar et al., 1981; Wagenaar, 1982b).

In the other study, researchers were able to partially control for the confounding factor of a beverage container deposit law. Beer, wine, and spirit sales in Maine were examined over a ten year period. Maine had also simultaneously raised its MLPA to 20 and instituted a mandatory deposit law during this time period. Beer sales significantly decreased after the MLPA was raised. Wagenaar and his colleagues, however, reasoned that if an increase in the price of beer, i.e., the mandatory deposit law, was responsible for the drop in sales, then it was reasonable to expect an increase in beer sales in New Hampshire, the only state bordering Maine, where beer prices were substantially lower. Beer sales in New Hampshire did not increase, until the MLPA was

lowered in that state (Wagenaar, 1982a; Wagenaar et al., 1981). There was no decrease in wine or spirit sales in Maine associated with raising the MLPA (Wagenaar et al., 1981; Wagenaar, 1982a; Wagenaar, 1982b).

Summing up past research, Wagenaar and Toomey (2002) noted that higher drinking ages were associated with lower alcohol consumption and lower drinking ages with more alcohol consumption; moreover, higher drinking ages were associated with fewer accidents and lower drinking ages with more accidents.³³

4.4 Does a Higher Purchase Age Alter Alcohol Consumption Patterns?

The MLPA appears to have a significant influence on teenage drinking locations.

According to an analysis of the drinking behaviors of a national sample of high school seniors from 1976 through 1987, high school seniors were much less likely to drink in bars and taverns after the MLPA was raised. In states which raised their MLPA from 18, there was a sharp decrease in bar and tavern drinking in the affected age group (O'Malley and Wagenaar, 1991).

Other studies support these findings. In a Massachusetts study, after the MLPA was raised from 18 to 20, fewer 16- to 19-year-olds reported drinking in bars, clubs or restaurants while more obtained alcohol at home or by having others buy it for them. These changes did not occur in New York where there was an 18-year-old MLPA law at the time of the study (Hingson et al., 1983).

A study of New York college students conducted after the MLPA was raised to 21 reported similar results. Those 19 and 20 were less likely to drink in public locations and more likely to drink in private ones. Students under 21 were less likely to drink in bars or restaurants and more likely to drink in residences and automobiles (George et al., 1989). Studies of college students in other states concur with these results (Hughes and Dodder, 1992; Lanza-Kaduse and Richards, 1989; O'Hare, 1990).

³³ The researchers conducted an in-depth analysis of 241 previous studies that examined the effectiveness of MLPA.

Concluding Remarks

The controversies surrounding the MLPA denote that the 21 MLPA laws curtail the individual liberties of those considered to be adult, further marginalize youth, and unfairly punish young people who drink responsibly. However, data consistently show that the benefits of a higher MLPA far outweigh the costs.

The 21 MLPA has improved traffic safety on both the state and federal levels, clearly illustrated by the significant reductions in alcohol-related traffic crashes for the relevant age groups.

A higher MLPA also appears to decrease adolescent drinking. Comparison analysis performed on the data from the 1982 and 1996 New York State Youth Alcohol Surveys indicated a notable reduction in self-reported underage consumption and purchase. Such a reduction influences a variety of other problems associated with teenage drinking: non-traffic-related accidents, suicides, illegal drug use, delinquency, risky sexual behavior, and lifetime alcohol use. Of course, not every underage drinker stopped using alcohol due to the MLPA law; some have chosen to circumvent the law and shift their drinking from public to private locations.

Although much has been achieved since the establishment of the 21 MLPA law, drinking and drinking driving continue to pose threats to the well-being of the underage population. Preponderant data have convincingly indicated fewer youth fatalities caused by alcohol-related crashes in recent years, but the statistics do not tell of the unspeakable pain a single highway death of a youth brings to his or her family and friends and of the devastating costs such a death brings to the community.

Findings from this literature review indicate the need for additional research and program analysis in several areas related to prohibiting alcohol purchase, service, and consumption. While the 21 MLPA law is reported to have significantly reduced alcohol-related activities among underage groups, it does not appear to have had an effect on alcohol use among college students, up to 75 percent of whom are under 21. Research efforts should be directed at examining specific prevention and intervention strategies for college campuses, such as college initiated alcohol policies, alcoholism treatment services tailored for students, and risk reduction programs including supervised parties, alcohol server training, and safe rides. Strategies proven efficacious should be introduced to the community of higher learning institutions.

While the 21 MLPA law in New York State has induced changes in parental attitudes towards alcohol use by young adults, changes in peer attitudes are relatively

small. Thus, parental attitude may have a more significant effect on alcohol use among the underaged than peer attitudes. Further research is needed to examine the extent to which peer approval encourages underage drinking and the extent to which the role of the parent affects the enforcement of the MLPA law.

More efforts should also be expended to raise awareness of the zero tolerance law. To maximize the impact of the zero tolerance law, the law must be known and understood by the targeted groups and the general public. Thus, more public information and education programs should be mounted to specifically publicize the zero tolerance law. Finally, traffic safety education should target not only young drivers but also pre-licensed youths, since such education may help to reduce their chances of involvement in drinking driving when they are ready to take the responsibility of driving a motor vehicle.

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