ALASKA LEGISLATURE COMMITTEE FILES 1981-1982 8672
1577 SHESS HB 110 - HB 112

HB

COMMITTEE REPORT

SENATE

FURTHER: Finance

3/19/81

Date: _____

Mr. President:

The Committee on HEALTH, EDUCATION AND SOCIAL SERVICES has had CSHB 110 (HESS)

WICHE student exchange program

under consideration and (a majority of the committee) (the committee) reports it back with the following recommendations:

[ ] do pass [ ] do not pass

[✓] do pass with attached amendments(s)

[ ] replace with CS for _____ [ ] same title [ ] new title

and recommends _____

[ ] AND attaches a "Letter of Intent" [ ] New Fiscal Note

[ ] reports it back without recommendation

[ ] referred to the _____ Committee

MEMBERS SIGNING
DO PASS

Tom Kelly

V. Finc Lee

Tony L Knowles

MEMBERS HAVING
OTHER RECOMMENDATIONS:

Charles Parr

CHAIRMAN

AMENDMENT

OFFERED IN THE SENATE: BY: Senate HESS

To: CSHB 110(HESS) SENATE BILL No. _____

HOUSE BILL No. 110

PAGE: 1 LINE: 16

change "marine" to "maritime"

CHIROPRACTIC MEDICINE

-- There are currently two fully accredited western schools:

Western States Chiropractic College in Portland
Los Angeles College of Chiropractic

-- One other school is a candidate for accreditation with full accreditation expected in 1983:

Cleveland Chiropractic College in Los Angeles

-- Three other Chiropractic schools have recently been established in California, so there is a definite development of training resources in this field

-- WICHE estimates that support would be $2500 - 3500 per student per year

-- Western States tuition, for example, is $1150 per quarter ($3450 per year)

-- This is a four year program leading to a Doctor of Chiropractic degree (with a two year preprofessional requirement)

-- Western States currently has eight Alaskan students enrolled

-- With other inquiries, we estimate supporting at least ten students the first year at $3500 = $35,000 total fee

-- WICHE would consider requesting the addition of Chiropractic to the regular exchange program in December 1981 making 1982-83 the earliest first year of support under the regular Student Exchange Program, but a bilateral agreement could be established with one or both of the eligible schools for 1981-82.

MARITIME TECHNOLOGY

-- Training in Maritime Technology prepares students to become licensed merchant marine officers and ships' engineers

-- In June of 1980, WICHE added Maritme Technology as an eligible field of study under the Student Exchange Program

-- This four-year program is offered at only one western institution, the California Maritime Academy in Vallejo, California, with a total enrollment of 470

-- The Academy offers two degree programs:

B.S. in Nautical Industrial Technology
B.S. in Marine Engineering Technology

-- Students are required to make three voyages on the Academy's school ship to meet U.S. Coast Guard requirements for license

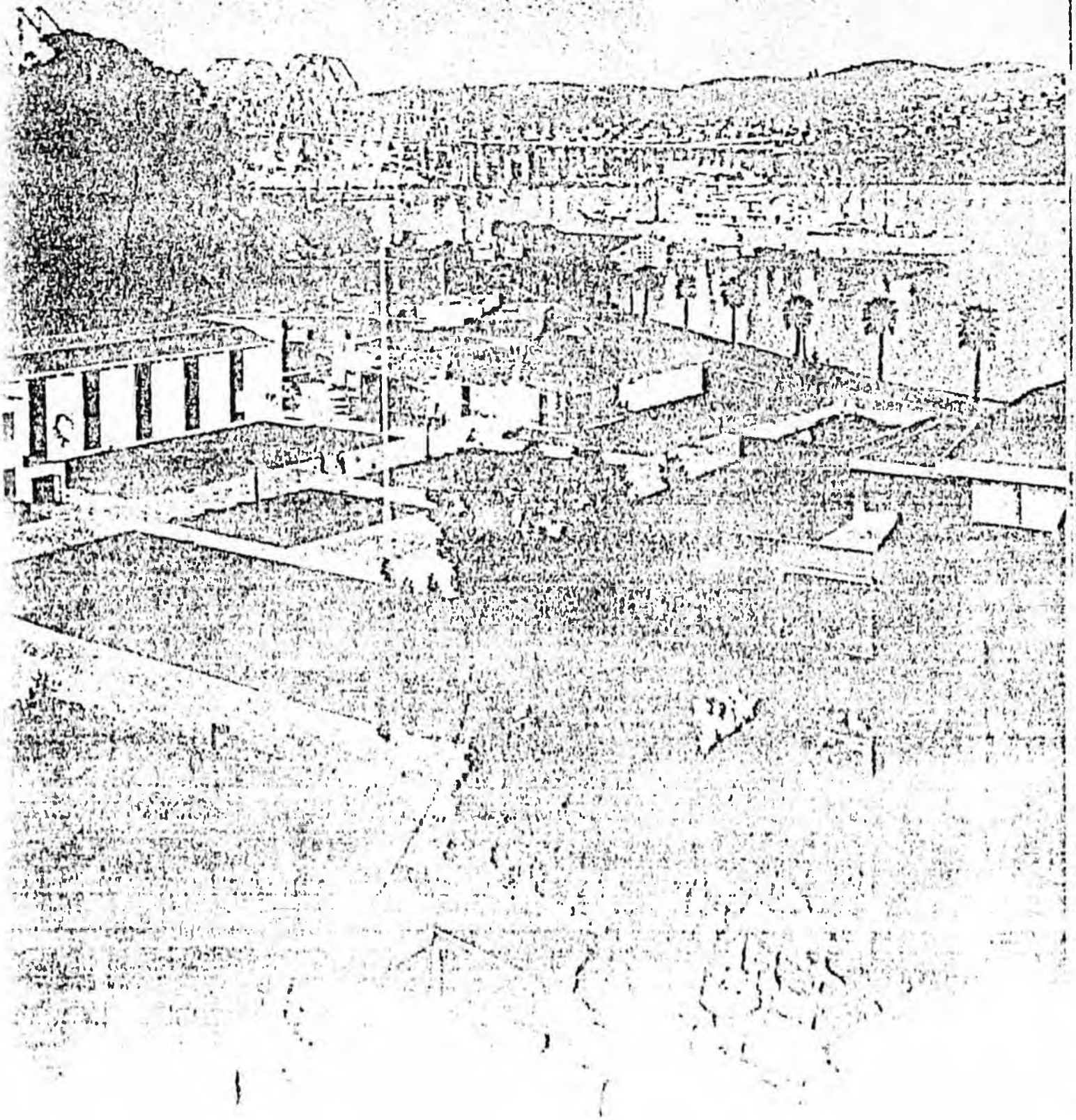
-- WICHE has established support fees of:

$6500 per student in 1981-82
$7000 per student in 1982-83

-- Six students have applied for 1981-82 WICHE participation. Three are currently enrolled at the Academy and two are accepted for 1981-82.

California Maritime Academy

By William M. Powers



A visitor to the California Maritime Academy (Cal Maritime) will see both similarities and differences between it and the country's military academies. It is those differences which distinguish Cal Maritime in both curriculum and purpose from its military counterparts.

Located in Vallejo, California, about 30 miles north of San Francisco, the California Maritime Academy marked its 50th anniversary last September. It has a student enrollment of about 470, of whom about 20 are women.

Outwardly, one will see some evidence of a military environment: uniforms, short haircuts, and traditional forms of military courtesy. A morning formation is held to muster the student body, and there is a demerit system for infractions of discipline. Though it is an educational facility of the state of California, the school receives extensive financial assistance from the federal government—hence, the requirement for uniforms. It also explains the presence of a department of naval science. A small staff of regular Navy officers and enlisted men teaches naval orientation courses and provides counseling for those contemplating active duty upon graduation.

Cal Maritime is a four-year, fully accredited institution, the only one of its kind on the West Coast. Its midshipmen pursue a program of education and training designed to provide them with hands-on experience so they are ready to function as licensed merchant marine officers immediately upon graduation. Unlike Navy ships, merchant ships have such small crews that there is no time to qualify a junior officer "on the job" to become a dependable deck or engineering officer. As Rear Admiral Joseph P. Rizza, U. S. Maritime Service, Cal Maritime's president since 1972, points out:

> "Practical experience learned here is the one factor which makes our graduates so valuable to the people who hire them.
>
> "A man or woman graduating from Cal Maritime and meeting all Coast Guard requirements would be expected to immediately take a bridge or engine room watch and the responsibility that goes with it. That can, and usually does occur the first day they are on board."

Practical experience is gained not only in the academy's classrooms, shops, and laboratories, but by long training voyages on board the 7,987-gross ton school ship *Golden Bear*. The ship typically spends 10-12 weeks each year on these voyages and embarks all except second classmen. Every midshipman is required to make three voyages to meet U. S. Coast Guard requirements for license.

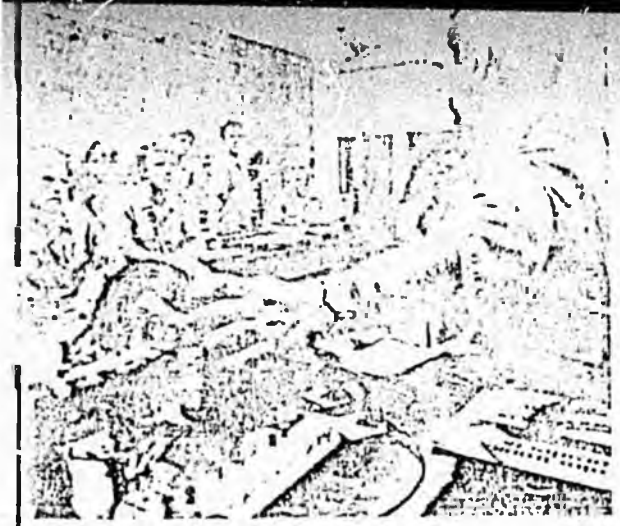
Though the responsibility for the safe operation of any vessel on the high seas must rest with her licensed officers and ultimately with her captain, midshipmen on board the *Golden Bear* are, by design, thrust into roles of responsibility. Midshipmen operate the engineering plant, stand deck watches, navigate, take on stores and fuel, and perform all the myriad tasks necessary to steam the ship. Senior midshipmen assume the leadership roles, while junior midshipmen serve in the subordinate positions. The faculty on board, all of whom are licensed merchant marine officers (many having tickets either as masters or chief engineers), serve essentially as advisors. To the extent possible, midshipmen during any given watch at sea will be either performing or supervising ship's work and evolutions in consultation with a faculty deck or engineering officer on watch.

The ship has visited a wide variety of ports over the years, ranging from the United States to those in South America, the South Pacific, and the Far East. The *Golden Bear*'s 1979 voyage, for example, went through the Panama Canal to New Orleans and also took her to ports in Mexico, California, Oregon, and Washington. Rizza has hopes of steaming the *Golden Bear* to the People's Republic of China someday, but with the rapidly escalating cost of bunker fuel, the voyage may be out of the question unless the federal government subsidizes the voyage.

First classmen returning from training voyages begin an intensive period of preparation for their license exams. This study period, combined with the months of practical experience on board the *Golden Bear*, virtually assures passing. The professional prospects of Cal Maritime graduates are excellent. While the blue-water U. S.-flag merchant marine fleet has sadly diminished in numbers during recent times, other areas of the maritime industry are almost begging for officers. Says Admiral Rizza:

> "We have had more jobs available in the last three years than we have had graduates. The maritime industries of California absolutely depend on our graduates for their personnel requirements. . . . Our graduates start at about $21,000 a year and I don't think any school can match that. I had a request for a block of 1,000 graduates to operate small craft for the offshore oil industry which we couldn't possibly meet, and we have had other similar requests for large numbers of officers."

Not a few graduates who are sailing on their tickets are earning $50,000 after taxes their first year at sea. Working conditions are excellent. Hours, pay (including overtime), living conditions, and terms of employment are all clearly defined and protected by maritime law and union contracts. Some shipping



Cal Maritime's president, Rear Admiral Joseph P. Rizza, emphasizes that it is the school's program, combining theoretical knowledge with practical training, which makes its graduates highly desirable to the maritime industry. Rizza spent 30 years as a naval officer before becoming president of the school in 1972.

lines are even considering letting wives go to sea with their husbands.

With such attractive pay and working conditions, it is little wonder that few graduates opt for active duty in the Navy. Under the Maritime Administration's General Order 87, all merchant marine midshipmen are required to apply for a commission in the Naval Reserve. In practice, few Cal Maritime grads find their way into the active Navy, although all incur a military obligation. Of the five options available to satisfy it, only one requires active duty for more than 30 days per year, while a second provides a commission as ensign in the Coast Guard.

The academy has long recognized that many of its graduates do not desire to remain at sea the rest of their lives. There are many jobs ashore in the maritime industry which require their type of educational background. Within the deck curriculum there is a dual emphasis on the management aspects of the maritime industry so that when such a job is available—in a shipping line's home office for example—the Cal Maritime grad is qualified to compete for it. Similarly, aspiring engineers receive an education much like that given to mechanical engineer majors in other colleges. They are qualified not only as ships' engineers, but can also function as engineering technologists in many diverse industries. Many have completed additional education to become fully qualified mechanical engineers.

"Students here at Cal Maritime are not Phi Beta Kappa types that will go on to postgraduate work," Admiral Rizza explains. "They are bright young kids who come here with good goals, are highly motivated and can relate what they learn in class and in the labs directly to their profession. They are all good at working with their hands. This school gives them an opportunity to make a good career and be a success in life. I don't think there is any other college in California that can provide young people with the opportunity that we can."

The [illegible] of Admiral Rizza's [illegible]

vying for the approximately 100 seats open each year. Academic standards for admittance have been tightened, and entrance exams are now required. The quality of campus facilities is being steadily improved. More than $8 million of new construction has been completed or funded within the last few years, including welding and radar simulation labs, a 500-seat auditorium, residence and dining halls.

The U. S. Maritime Administration has predicted a severe shortage of shipboard officers within the U. S. merchant marine by the mid-1980s. The average age of such officers is now estimated to be in the mid-50s. As more and more of these officers retire from service, those younger officers now sailing are virtually assured of promotion. A master of a U. S.-flag vessel earns between $50,000 and $60,000 annually, with those in command of liquefied natural gas (LNG) tankers, making even more. It is ironic that in a time when the United States must depend in large measure on foreign bottoms to transport its goods and commodities abroad, there is a dearth of qualified officers for the berths available.

If and when the blue water U. S. merchant marine fleet improves its unhealthy—if not moribund—position in world shipping, schools such as the California Maritime Academy will be an important factor in providing adequate numbers of qualified merchant marine officers.

Mr. Powers is editor of publications for the Port of San Diego. This is his 15th major illustrated article on the *Propeller*. Previous pictorials have addressed a wide variety of subjects, including the Republic of China Navy, the F-14 Tomcat fighter, the U. S. Coast Guard Academy, and historical pieces from Japan and the Philippines. He is a graduate [illegible] San Diego State University and has done graduate work in photojournalism at Syracuse University. Mr. Powers retired from naval service in 1974 as a senior chief petty officer. He served as a naval photographer [illegible] the Philippines, the Naval War College and in Washington [illegible]

STATE OF ALASKA

JAY S. HAMMOND, GOVERNOR

ALASKA COMMISSION ON POSTSECONDARY EDUCATION

POUCH F - STATE OFFICE BUILDING
JUNEAU, ALASKA 99811
(907) 465-2854

February 23, 1981

The Honorable Charles H. Parr
Alaska State Senate
Pouch V
Juneau, AK 99811

Dear Senator Parr:

Enclosed for your information is a list of students currently supported under the 1980-81 WICHE Professional Student Exchange Program. The listing is arranged by the students' home communities to show participants from your district. Names of particpating WICHE students have been sent to local newspapers in the State.

A brochure describing the Student Exchange Program is also enclosed. If you would like further information about WICHE or applications for the program, please contact me at the Alaska Commission on Postsecondary Education. Although the 1981-82 deadline has passed, we are still accepting applications for the 1981-82 academic year. Eligible students will be placed on alternate status for 1981-82 certification.

Sincerely,

Jane Byers Maynard

Jane Byers Maynard
Director for Special Programs

Enclosures

WICHE NEWS
WESTERN INTERSTATE COMMISSION FOR HIGHER EDUCATION

P.O. DRAWER P., BOULDER, COLORADO 80302
PHONE (303) 492-5082

FOR IMMEDIATE RELEASE

CONTACT: Paul Albright
(303) 497-0273

A total of 230 Alaskans are studying in professional fields in other states this school year through a cooperative program that expands educational opportunities beyond state boundaries and across a multistate region.

Through the Student Exchange Program of the Western Interstate Commission for Higher Education (WICHE), the students pay resident tuition at public institutions or about one-third the normal tuition at private schools. The state of Alaska then makes a cost-of-education payment to the receiving school on behalf of the student.

This year, Alaska is assisting students in 14 professional fields offered in the WICHE program: medicine, dentistry, veterinary medicine, physical therapy, occupational therapy, optometry, podiatry, forestry, graduate library studies, law, pharmacy, graduate nursing education, public health, and architecture.

One hundred and forty-two of the 230 Alaska exchange students are pursuing law degrees this year at 26 schools in 10 western states.

A total of 275 Alaskans have graduated as exchange students since WICHE was founded in 1953 to assist western states to improve higher education opportunities through interstate sharing of programs and resources. In this way, said Phillip Sirotkin, executive director of WICHE, Alaska is able to provide educational access to its citizens and help meet its professional manpower needs without having to duplicate costly professional programs that already are available in the region.

Several currently enrolled students and recently graduated students expressed their appreciation for the WICHE program in recent correspondence to Governor Jay S. Hammond and WICHE's appointed commissioners from Alaska.

"The WICHE program went a long way toward compensating for the fact that I had to leave Alaska to attend school," wrote Ed Hein of Juneau, who recently completed law studies at the University of Puget Sound. He said he believed the interstate exchange program served Alaska better than establishing a law school in the state.

-more-

A current law student, Mark Gumaer, and a medical student, George I. Lee, both of Fairbanks, noted they would not have been able to pursue their professional studies without state assistance through the WICHE program.

"I have been able to put more time into my studies and I believe have gotten more out of this year than I would have, had I been in a financial bind," said Gumaer, who is enrolled in a special law program at Golden Gate Law School.

Lee said he was able to complete his first year of medical school at the University of California, San Francisco, "without undue financial difficulty, and on some sort of financial equality with the other students."

Persons interested in learning more about WICHE's Professional Student Exchange Program can contact the state's certifying officer for the program. He is Kerry Romesburg, executive director of the Alaska Commission on Postsecondary Education, Pouch F, State Office Building, Juneau, Alaska 99811; (907) 465-2855. Dr. Romesburg is also chairman-elect of the 13-state WICHE Commission which oversees programs of the organization.

Other members of the Commission from Alaska are Sue S. Greene of Anchorage and Glenn Hackney of Fairbanks.

-30-

2/81

EDITORS: A list of students from Alaska participating in this professional student exchange program is attached.

PLEASE NOTE

THE ORGINAL FILE CONTAINS AN OVERSIZED DOCUMENT THAT IS UNSUITABLE FOR FILMING. PLEASE REFER TO THE ALASKA STATE ARCHIVES TO VIEW THE ORIGINAL.

WICHE BROCHURE

"YOUR STATE CAN HELP YOU OBTAIN PROFESSIONAL EDUCATION IN ..."

HB

112

STATUS OF DRIVER EDUCATION IN ALASKAN SCHOOL 1981-82

APPROVED PROGRAMS

Enrollment in Grades 10-12

School	Dr. Educ.	
75	20	Adak
34	10	Anderson
252	15	Barrow
241	60	Ben Nielson
197	8	Bering Strait
172	45	Bethel
109	20	Dillingham
95	36	Haines
201	40	Homer
62	16	Hoonah
476	100	Kenai
577	120	Ketchikan
29	8	King Cove
1102	40	Kodiak
135	20	Kotzebue
744	175	Lathrop
88	39	Metlakatla
46	9	Nenana
414	160	North Pole
121	30	Petersburg
49	6	Quinhagak
26	10	Sand Point
122	32	Seward
369	103	Sitka
39	15	Skagway
409	150	Soldotna
27	9	Susan B. English
18	7	Thorne Bay
50	20	Tri-Valley
236	49	Valdez
671	150	West Valley
117	31	Wrangell
7303	1553 (21%)	

NON-APPROVED PROGRAMS

Enrollment in Grades 10-12

School	Dr. Educ.	
		Anchorage
1364	75	Bartlett
745	58	Chugiak
1169	75	Dimond
1525	139	East Anchorage
1309	175	Service
1549	95	West Anch.
135	12	Delta Junction
36	15	Galena
46	12	Ninilchik
142	12	Nome-Beltz
7885	668 (8%)	

Enrollment Summary - Grades 10-12

	School	Dr. Educ.
App. Prog.	7303	1553
Not. App.	7885	668
No Program	4923	
	20,111	2221 (11%)

STATE OF ALASKA
THE LEGISLATURE

POUCH Y - STATE CAPITOL
JUNEAU, ALASKA 99811
907-465-3800

LEGISLATIVE AFFAIRS AGENCY

M E M O R A N D U M May 4, 1982

SUBJECT: Single subject rule

TO: Senator Charles H. Parr

FROM: Billy G. Berrier
Director
Division of Legal Services

You have asked whether questions for an advisory vote relating to increasing the drinking age and legalizing the use of marijuana may be combined in one bill without violating the single subject rule.

The single subject rule is contained in Section 13, Article II, Constitution of the State of Alaska which provides:

> SECTION 13. Every bill shall be confined to one subject unless it is an appropriation bill or one codifying, revising, or rearranging existing laws. Bills for appropriations shall be confined to appropriations. The subject of each bill shall be expressed in the title. The enacting clause shall be: "Be it enacted by the Legislature of the State of Alaska."

The primary aim of the rule has been stated by our court to be restraint of the log-rolling process in the legislature and describes log-rolling as deliberately inserting in one bill several dissimilar or incongruous subjects in order to secure the necessary support for passage of the measure. Suber v. Alaska State Bond Committee, 414 P.2d 546 (1966).

The test which broadly stated:

> "Ultimately the decision in cases of this kind must be made on a basis of practicality and reasonableness. In

determining whether a bill is confined to one subject we agree with the statement:

> 'All that is necessary is that the act should embrace some one general subject; and by this is meant, merely, that all matters treated of should fall under some one general idea, be so connected with or related to each other, either logically or in popular understanding, as to be parts of, or germane to, one general subject.'"

was adopted in Gellert v. State, 522 P.2d 1120 (Alaska 1974), and has been quoted in each subsequent case in point in Alaska with approval. It is therefore well settled that this broad language is the standard against which compliance with the single subject rule is to be tested.

There would appear to be a connection both logically and in popular understanding between the use of alcohol and the use of marijuana since the use of either has related although not identical social policy implications.

In my opinion this would not violate the single subject rule.

BGB:ljb

POSITION PAPER/Department of Health & Social Services

POSITION PAPER

CS for HB 112 (Judiciary) Am

"An Act relating to age limits under Title 4, Alcohol Beverages".

Overview

Passage in 1971 of the 26th Amendment to the United States Constitution not only allowed 18 year olds to vote but this action assisted in extending certain other privileges to this age group. During the period of 1970 to 1975, 27 states including Alaska, lowered their minimum drinking age for all alcoholic beverage, and another 11 states lowered the drinking age for wine and/or beer. However, 1976 saw a reversal of this trend when Minnesota raised its minimum drinking age and as of January, 1982, 14 other states have also raised their drinking age. A key factor in states decisions to raise drinking ages has been their experience of sharp increases in alcohol-related highway accidents and fatalities that have coincided with the reduction in drinking age. Massachusetts, for example, found that traffic fatalities involving drinking teenagers nearly tripled in the years following lowering the legal drinking age.

Alaska Experience

Alcohol abuse and alcoholism are generally recognized as Alaska's number one health and social problems. Alcohol has also been linked with the state's high accidential death rate and other manifestations of social ills, such as homicide, suicide, crime, violence, child and spouse abuse and neglect, etc.

Youth of Alaska are not immune from the ill effects of alcoholism and alcohol abuse. For example, the State Alcoholism Plan estimates that over 7,000 of Alaska's youth are problem drinkers, defined as drinking alcohol to an extent, or in a manner that an alcohol-related disability is displayed. Also, our state-funded alcoholism treatment programs report that clients under age 20 make up 10.3% of all persons seen for treatment and counselling. Our Department finds 24.8% of all youth arrests age 18 and under are for alcohol related offenses. (Attachment)

The Department of Public Safety, 1982 Highway Safety Plan, indicates that in 1979 age group 15-18 were involved in 11.3% of Alaska alcohol related motor vehicle accidents yet this same age group constitutes only 3.4 % of the licensed drivers. The Department believes alcohol is more accessible to this age group with the current legal drinking age of 19 than it would be if the age were 21 because of the "pass-down" effect. In 1981, liquor law violations accounted for 1,918 arrests of youth age 18 and under, while 209 of this age group were arrested for driving under the influence.

These statistics appear to indicate that alcoholism and alcohol abuse continues to be a serious health and social problem in the State and to which our youth are vulnerable as well.

Department's Position

The Department is supportive of raising the drinking age and views this action as an effective tool in decreasing alcohol related problems among Alaskan youth.

Recommended by: Robert L. Cole by George Ingundelf

Robert L. Cole
Coordinator
Office of Alcoholism & Drug Abuse

Date: 5/5/82

Approved by: H Trasler for

Helen D. Beirne
Commissioner
Department of Health & Social Services

Date: 5/5/82

Clients Receiving Alcohol Abuse Treatment by Age - 1980

0-15	16	17	18	19	20
101	54	94	174	195	221

Statewide Arrests - 1981

	0-15	16	17	18	19	20	21
Driving Under Influence	7	21	69	112	179	132	134
Liquor Law Violations	368	421	610	499	66	39	38

THE LEGISLATURE OF THE STATE OF ALASKA
TWELFTH LEGISLATURE

FISCAL NOTE

I. REQUEST
Bill/Resolution No. CS for HB 112 (Judiciary) Am
Title "An Act Relating to Age Limits under Title 04, Alcoholic Beverages"
Requested by Senate - Health & Social Services Date May 3, 1982

II. FISCAL DETAIL
Agency Affected Department of Health and Social Services
Program Category Affected Alcoholism & Drug Abuse
BRU, Program, Or Subprogram(s) Affected Administration / Grants
(Note: If more than one budget component is affected, separate line-item amounts and funding for each component in the analysis section.)

EXPENDITURES (Thousands of Dollars)

	FY 82	FY 83	FY 84	FY 85	FY 86	FY 87
100 PERSONAL SERVICES						
200 TRAVEL						
300 CONTRACTUAL						
400 COMMODITIES						
500 EQUIPMENT						
600 LAND & STRUCTURES						
700 GRANTS,CLAIMS,ETC.						
TOTAL	-0-	-0-	-0-	-0-	-0-	-0-

FUNDING (Thousands of Dollars)

GENERAL FUND						
FEDERAL FUNDS						
OTHER (Specify Source)						
POSITIONS	-0-	-0-	-0-	-0-	-0-	-0-
FULL TIME						
PART TIME						
TEMPORARY						
	-0-	-0-	-0-	-0-	-0-	-0-

III. ANALYSIS (See Fiscal Note Preparation Instruction, Section III)

Robert L. Cole JCC

IV. DATE 5/3/82 PREPARED BY Robert L. Cole
AGENCY State Office of Alcoholism and Drug Abuse
PHONE 586-6201

Original: Legislative Finance
cc: Budget and Management
Prime Sponsor (First Legislator Named) Martin
33-001 (Rev. 12/81)

Fresh Air

ACTUARIES IN REGULATION Vol. 1 Number 3 April 1982

CAS REVIEWS AIR CONSTITUTION

The Casualty Actuarial Society Board of Directors meeting May 23 in Palm Beach, Florida, will officially consider the petition of Actuaries In Regulation to become the first CAS Section. Robert Gossrow, AIR pro-temp secretary, has submitted the necessary petitions and proposed constitution to CAS Secretary Brian Scott.

Preliminary exposure of the AIR constitution to CAS Directors resulted in revision allowing any interested CAS member to be an officer of AIR. With this change, no opposition to the AIR petition is expected.

Other features of the proposed constitution include: voting by mail, subscribership for interested state employees not CAS members, a newsletter editor as officer and executive committee member, the first meeting each year will be the Annual Meeting when officers are elected. Other than holding office and voting, no distinction has been drawn between members and subscribers.

CAS members wishing to join AIR and others seeking to establish subscriber status, should send requests to Robert W. Gossrow, Illinois Dept. of Insurance, 320 West Washington, Springfield, Illinois 62767. Others serving AIR during its organization have been Gary Granoff (Florida) president, Charles Potok (S. Carolina) vice-president, and Michael Lamo (Oregon) editor.

NEWS GUST: NAIC Creates Interdepartmental Resources Task Force

The NAIC has established an Interdepartmental Task Force to catalog resource needs of various state regulators and the resources available within the various state departments. Chairing the match-making project will be Commissioner Bill Gunter of Florida.

NAIC Considers New State Data System

The NAIC EXI Subcommittee directed the Support and Services Office (SSO) to prepare a complete proposal for internally operating the state time sharing system beginning September 1982.

The arrangement with the Service Bureau Company (SBC) through January 1982 would have cost approximately $600,000 per year to continue. An interim agreement at a reduced cost has greatly restricted state access to the system. States will be allowed only $200 per month in time charges through May, then $1,000 per month for June, July and August. Thereafter, until sometime early in 1983, states would have to make their own arrangements with SBC. September and October were the months of greatest utilization of the system by state subscribers in 1981. The interim arrangement allows states to run IRIS reports weekly and run annual report tabulations during the summer months.

continued on page 3

Published quarterly by Actuaries In Regulation
Editorial office: c/o Casualty Actuary, Oregon Insurance Division, Commerce Building, Salem, OR 97310
Subscriptions: c/o Casualty Actuary, Dept. of Insurance, 320 W. Washington, Springfield, IL 62767

From a Former Actuary (continued)

On the other side of the coin, I met many of the senior actuaries in the business and was spurred on in my actuarial studies by their encouraging words.

I still consider myself an actuary in regulation. My work these days again involves the concerns for solvency and fair treatment of policyholders. I feel as if I've come full circle and I'd like to think that I contribute as much if not more to the goals and objectives of regulation now than I did during those unforgettable years in Madison.

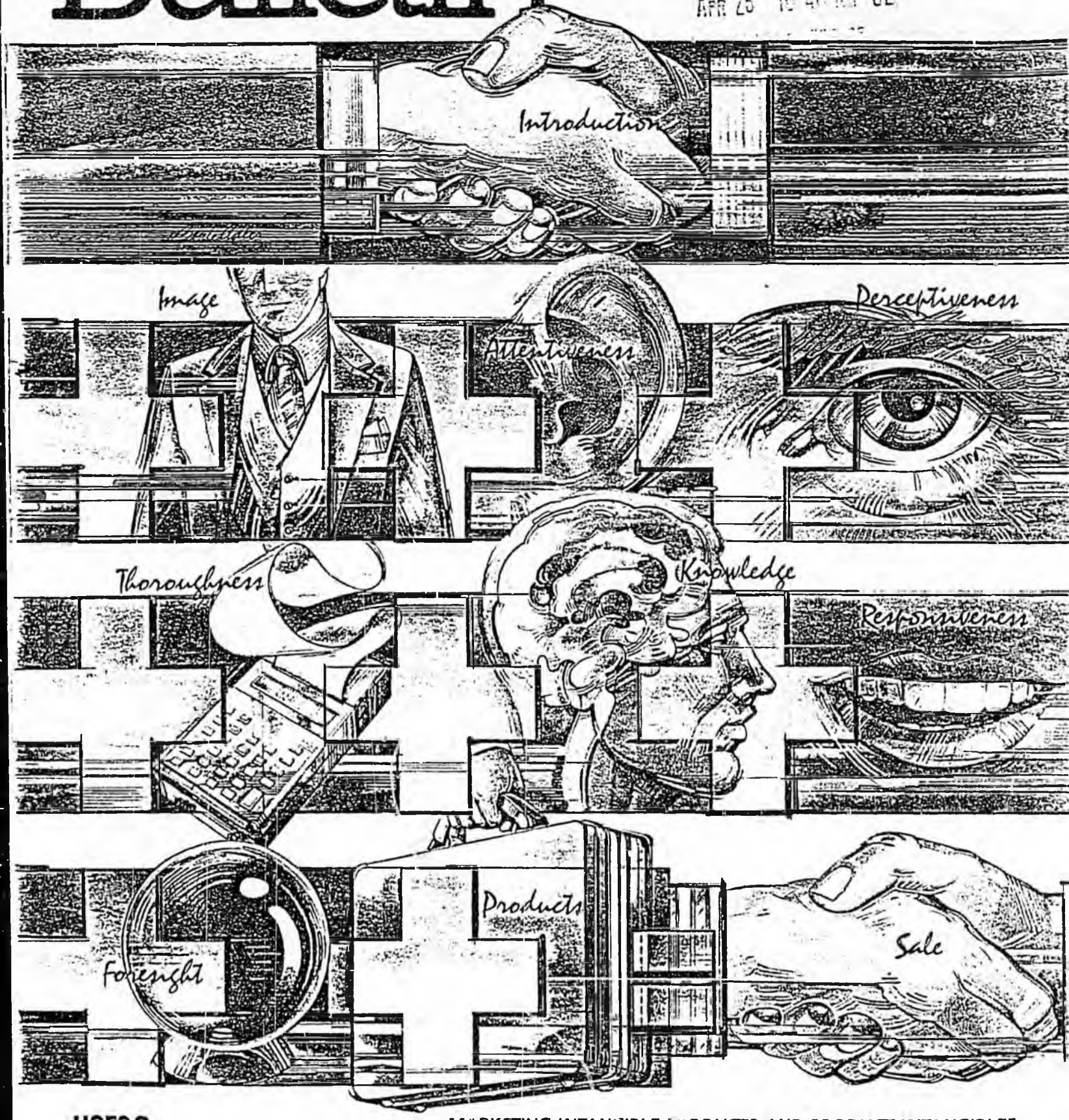
FRESH STATISTICS ON AUTOMOBILE ACCIDENTS

In the Statistical Section of the Missouri Division, Jackie Gordon and Mary Lou Clark prepare amazing statistical reports on all subjects almost daily. This recently came to the FRESH AIR file based on 1979 data supplied by the Missouri Highway Patrol and Department of Public Safety:

Driver Age	% of: Licensed Drivers	All Accidents	Accidents Involving Drinking
0 - 15	---	0.2%	0.2%
16 - 24	23.8%	35.6	41.0
25 - 34	23.3	25.1	26.8
35 - 44	15.9	13.1	13.4
45 - 54	13.7	9.8	9.6
55 - 64	12.2	7.5	5.4
65 +	11.1	6.5	3.6
Unknown	---	2.3	---
	100.0%	100.0%	100.0%

1982 / NO. 1

Bulletin

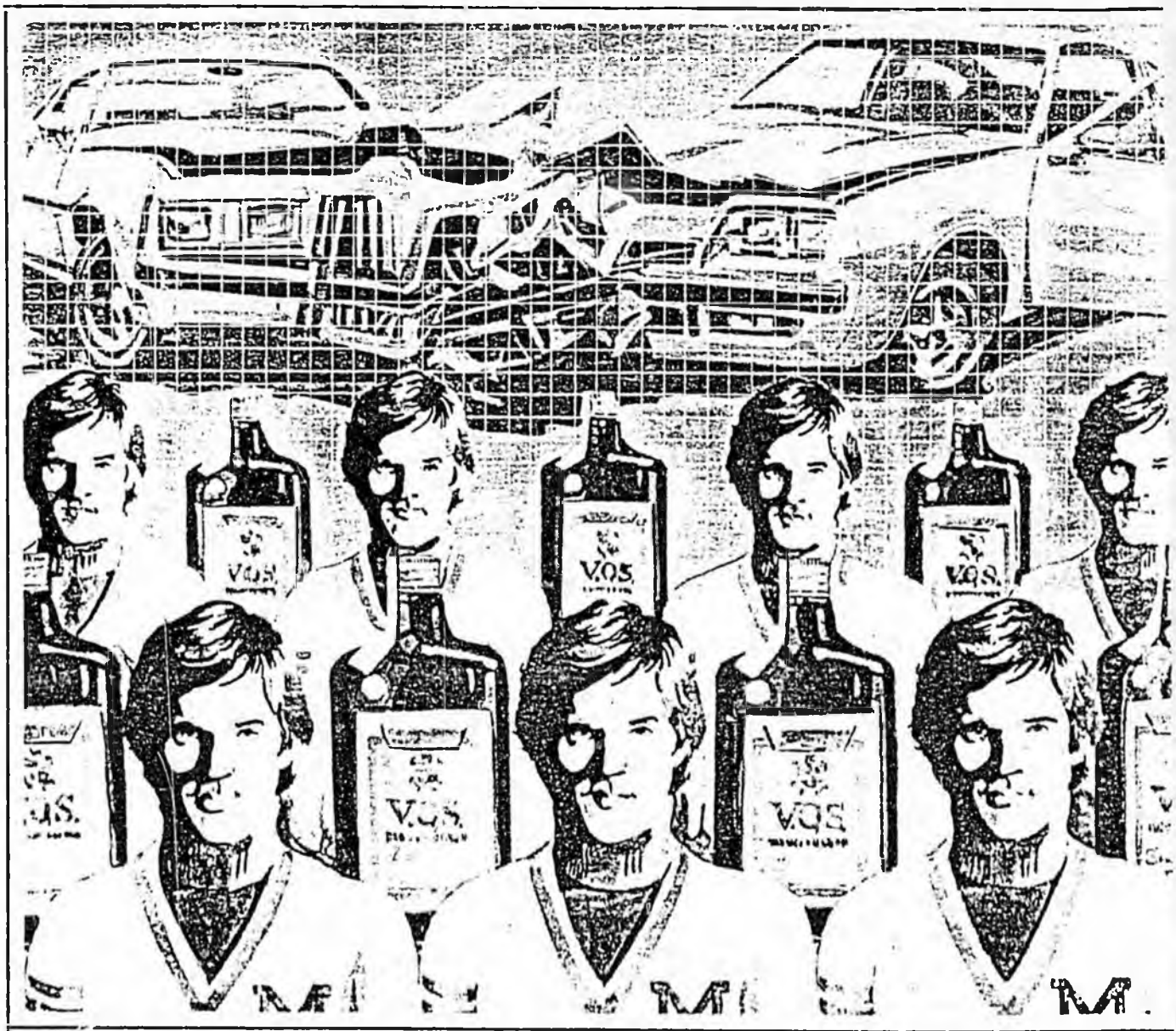


USF&G
INSURANCE

MARKETING INTANGIBLE PRODUCTS AND PRODUCT INTANGIBLES

SEE PAGE 10

I N T H I



DRINKING AGE, TRAFFIC ACCIDENTS LINKED

Traffic accidents involving young people seem to fluctuate with the rise and fall in a state's minimum legal drinking age. The Insurance Institute for Highway Safety found a 28% average drop in nighttime fatal crashes by young drivers in nine states that raised their minimum drinking age in the past five years.

Michigan, like many states, has tried it both ways. In 1972, Michigan dropped its minimum drinking age to 18 years from 21. In the ensuing seven years, alcohol-related traffic accidents by young drivers rose 20% over the predicted number, according to Alexander Wagenaar of the University of Michigan's Highway Safety Research Institute. In 1978, Michigan drinking age was put back to 21 a crashes dropped 20%. "It's a striki similarity," says Mr. Wagenaar.

Twenty-nine states dropped th drinking ages in the early 197 Since then, 16 states have thoug better of the idea and have raised t age limit by at least one year.

Official Business

Alaska State Legislature

Senate

Committee on

Health, Education & Social Services

Charlie Parr, Chairman
Terry Stimson, Vice-Chairman
Vic Fischer
Tim Kelly
Mike Colletta

Pouch V
State Capitol
Juneau, Alaska 99811

465-4907
465-4908

May 17, 1982

LETTER OF INTENT
ON
SENATE (HESS) COMMITTEE SUBSTITUTE for CSHB 112 (Jud) am

It is the intent of the Health, Education and Social Services Committee that:

The legislature finds that there is a serious highway safety problem caused by persons driving under the influence of alcohol, and that a disproportionate number of alcohol related traffic fatalities involve persons under the age of 19.

The legislature further finds that in many cases existing law may contribute to this problems. AS 04, which prohibits young people from frequenting establishments which serve alcohol, leads them to drive to out-of-way places to socialize. Behavior in such places tends to be less controlled and may result in driving under the influence of alcohol.

The legislature recognizes that for most young people a driver's license is a "key to the world" and is highly prized. It is the intent of SCS HB 112 that revocation of the drivers license be a significant deterrent. Loss of a drivers license for a substantial period may for young people be a more significant deterrent than a short period of imprisonment. It is further the intent that young people be encouraged not to drink and drive by increasing the number of places they may legally frequent, to eat, listen to music, and dance. Nothing in SCS HB 112 is to be interpreted as changing existing law as to the age at which they may legally drink alcohol.

Senator Charles H. Parr
Chairman

PLEASE NOTE: THE FOLLOWING PAGES WERE TREATED AS A UNIT IN THE ORIGINAL DOCUMENT

POSITION PAPER/Department of Health & Social Services

POSITION PAPER

CS for HB 112 (Judiciary) Am

"An Act Relating to Age Limits Under Title 4, Alcoholic Beverages".

The Office of Alcoholism and Drug Abuse is highly supportive of this bill. The Office has hard scientific information from other states (Michigan, Maine) that when the legal drinking age in those states was lowered, during the 70's, the automobile accident death and injury rate rose by roughly 20%. Conversely, when the legal drinking age in those states was raised back to 21, the rate of automobile accident death and injury was reduced by roughly 20%. (See attachment I)

Much has been made of the argument that if young men 18-21 are old enough to serve in the military, they are old enough to drink. Recent evidence shows that the U.S. Military is suffering major and debilitating performance and readiness problems, precisely because of high levels of alcohol (and drug) misuse, primarily among its lower enlisted ranks, age 18-25.

Further, Alaska with its multitude of behavioral problems, stemming largely from alcohol abuse, experiences disproportinate rates of crime, suicide and accidental death and injury, mainly amoung young males in their late teens and early twenties.

Based on the evidence from other states, there is no doubt in our minds that alcohol related problems among teenagers and twenty year olds would be substantially reduced by enactment of this bill into law.

Recommended by: Robert L. Cole

Robert L. Cole
Coordinator
Office of Alcohlism &
Drug Abuse

Date: 5-3-82

Approved By:

Helen D. Beirne
Commissioner
Department of Health &
Social Services

Date: 5 3 82

THE LEGISLATURE OF THE STATE OF ALASKA
TWELFTH LEGISLATURE

FISCAL NOTE

I. REQUEST
Bill/Resolution No. CS for HB 112 (Judiciary) Am
Title "An Act Relating to Age Limits under Title 04, Alcoholic Beverages"
Requested by Senate - Health & Social Services Date May 3, 1982

II. FISCAL DETAIL
Agency Affected Department of Health and Social Services
Program Category Affected Alcoholism & Drug Abuse
BRU, Program, Or Subprogram(s) Affected Administration / Grants
(Note: If more than one budget component is affected, separate line-item amounts and funding for each component in the analysis section.)

EXPENDITURES (Thousands of Dollars)

	FY 82	FY 83	FY 84	FY 85	FY 86	FY 87
100 PERSONAL SERVICES						
200 TRAVEL						
300 CONTRACTUAL						
400 COMMODITIES						
500 EQUIPMENT						
600 LAND & STRUCTURES						
700 GRANTS,CLAIMS,ETC.						
TOTAL	-0-	-0-	-0-	-0-	-0-	-0-

FUNDING (Thousands of Dollars)

GENERAL FUND						
FEDERAL FUNDS						
OTHER (Specify Source)						
POSITIONS	-0-	-0-	-0-	-0-	-0-	-0-
FULL TIME						
PART TIME						
TEMPORARY						
	-0-	-0-	-0-	-0-	-0-	-0-

III. ANALYSIS (See Fiscal Note Preparation Instruction, Section III)

IV. DATE 5/3/82 PREPARED BY Robert L. Cole JCC
AGENCY State Office of Alcoholism and Drug Abuse
PHONE 586-6201

Original: Legislative Finance
cc: Budget and Management
Prime Sponsor (First Legislator Named) Martin
33-001 (Rev. 12/81)

UM-HSRI-81-58

RAISING THE LEGAL DRINKING AGE IN MICHIGAN AND MAINE

Alexander C. Wagenaar
Richard L. Douglass
Charles P. Compton

WITH THE ASSISTANCE OF
Leslie C. Pettis

DECEMBER 1981

THE UNIVERSITY OF MICHIGAN
HIGHWAY SAFETY RESEARCH INSTITUTE

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16. Abstract

Previous research has shown that increased alcohol availability associated with reductions in legal minimum age for purchase of alcoholic beverages resulted in increased alcohol-related traffic crash involvement among young drivers. In the late 1970s, Michigan raised the drinking age from 18 to 21, and Maine from 18 to 20, providing natural experiments reducing alcohol availability. Effects of the raised drinking age on motor vehicle crash involvement were evaluated using a tri-level hierarchical multiple time-series design.

Results revealed a significant 20% reduction in alcohol-related injury-producing crash involvement among 18-20-year-old Michigan drivers directly attributable to the higher drinking age; alcohol-related property damage crashes decreased 17% for this age group. Maine drivers age 18-19 experienced a 20% reduction in alcohol-related property damage crash involvement attributable to the raised drinking age.

It is concluded that the legal minimum drinking age has a significant effect on alcohol-related motor vehicle crash involvement among young drivers. Implications of the findings for beverage alcohol availability theory and public policy concerning the prevention of alcohol-related problems are included.

17. Key Words	18. Distribution Statement
Legal drinking age, traffic accidents, alcohol availability, Box-Jenkins Time Series Analysis	Unlimited

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Of Highway Safety Research Institute staff, Oliver Carsten participated in the building of the Maine crash files, and Lee Ferris and Michelle Shepherd assisted with word processing and administrative details.

The authors gratefully acknowledge the contributions of all these individuals and organizations. However, the findings, conclusions and recommendations reported here are solely those of the authors.

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1.0 INTRODUCTION

After the repeal of prohibition in 1933, all states established minimum legal ages for purchase and consumption of alcoholic beverages; most states set the minimum drinking age at 21, while a few chose drinking ages between 18 and 20. Little attention was given to these laws over the subsequent three and a half decades. The controversy surrounding the drinking age began in 1970 with passage by the Congress, and subsequent ratification by the states, of the 26th amendment to the U.S. Constitution extending the right to vote in federal elections to citizens between 18 and 21 years of age. A movement to extend the rights and privileges of adulthood to youth aged 18 and over began, and within three years all 50 states extended the right to vote in state elections to 18-year-olds. During this period, 29 states reduced their minimum legal drinking ages (Table 1.1).[1]

Following the reductions in drinking age, considerable controversy emerged in academic, law enforcement, political, and industry circles concerning the wisdom of lowering the drinking age (Michigan Licensed Beverage Association, 1973; Works, 1973; Distilled Spirits Council of the United States, 1973a, 1973b; Bowen and Kagay, 1973; Zylman, 1973, 1974; Douglass, 1974). Uncontrolled analyses of early data were used by some partisans in the political debate to argue that huge increases in youthful alcohol-related motor vehicle crashes occurred after the reduction in drinking age (Michigan Council on Alcohol Problems, 1973). Others argued that the observed crash increases were a result of changes

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[1]Published literature on legal drinking age has provided conflicting information on the number of states that have changed the drinking age. Information on legal drinking age changes provided here was based on a comprehensive survey of all 50 states conducted by Wagenaar (1981).

TABLE 1.1

States Lowering the Minimum Legal Drinking Age: 1970-1975

State	Effective Date	Description of Change
Alabama	7/75	21 to 19 - all beverages
Alaska	9/70	21 to 19 - all beverages
Arizona	8/72	21 to 19 - all beverages
Connecticut	10/72	21 to 18 - all beverages
Delaware	7/72	21 to 20 - all beverages
Florida	7/73	21 to 18 - all beverages
Georgia	7/72	21 to 18 - all beverages
Hawaii	3/72	20 to 18 - all beverages
Idaho	7/72	21 to 19 - wine and distilled spirits; 20 to 19 - beer
Illinois	9/73	21 to 19 - beer and wine only
Iowa	4/72	21 to 19 - all beverages
Iowa	7/73	19 to 18 - all beverages
Maine	6/72	20 to 18 - all beverages
Maryland	7/74	21 to 18 - beer and light wine only
Massachusetts	3/73	21 to 18 - all beverages
Michigan	1/72	21 to 18 - all beverages
Minnesota	6/73	21 to 18 - all beverages
Montana	7/71	21 to 19 - all beverages
Montana	7/73	19 to 18 - all beverages
Nebraska	6/72	20 to 19 - all beverages
New Hampshire	6/73	21 to 18 - all beverages
New Jersey	1/73	21 to 18 - all beverages

State	Effective Date	Description of Change
Rhode Island	3/72	21 to 18 - all beverages
South Dakota	7/72	19 to 18 - 3.2 beer only
Tennessee	5/71	21 to 18 - all beverages
Texas	8/73	21 to 18 - all beverages
Vermont	7/71	21 to 18 - all beverages
Virginia	7/74	21 to 18 - beer only
West Virginia	6/72	21 to 18 - distilled spirits (beer and wine were 18 since 1935)
Wisconsin	3/72	21 to 18 - all beverages except beer which has been 18 since 1933
Wyoming	5/73	21 to 19 - all beverages

in police reporting practices, growth in the population of young drivers, and long-term trends in the incidence of traffic accidents (Zylman, 1974). By the mid-1970s, controlled studies of the effects of lowered drinking ages began to appear both in the United States and Canada. Most of these investigations found significant increases in alcohol-related motor vehicle accidents among young drivers attributable to the lowered drinking age. Several studies also reported increased consumption of alcoholic beverages after the lowered drinking ages went into effect. As the evidence documenting the adverse effects of the lowered drinking age on alcohol-related problems accumulated, the trend toward reducing the drinking age reversed. No states have lowered their drinking age since 1975, and at least 15 states raised their drinking

ages between 1976 and 1981 (Table 1.2). Current legal minimum drinking ages in the 50 states as of April 1981 are listed in Table 1.3.

TABLE 1.2

States Raising the Minimum Legal Drinking Age: 1976-1981

State	Effective Date	Description of Change
Florida	10/80	18 to 19 - all beverages
Georgia	9/80	18 to 19 - all beverages
Illinois	1/80	19 to 21 - beer and wine only
Iowa	7/78	18 to 19 - all beverages
Maine	10/77	18 to 20 - all beverages
Massachusetts	4/79	18 to 20 - all beverages
Michigan	12/78	18 to 21 - all beverages
Minnesota	9/76	18 to 19 - all beverages
Montana	1/79	18 to 19 - all beverages
Nebraska	5/80	19 to 20 - all beverages
New Hampshire	5/79	18 to 20 - all beverages
New Jersey	1/80	18 to 19 - all beverages
Rhode Island	7/80	18 to 19 - all beverages
Rhode Island	7/81	19 to 20 - all beverages
Tennessee	6/79	18 to 19 - all beverages
Virginia	7/81	18 to 19 - off-premise beer only

The purpose of this study was to evaluate the effects of returning to higher drinking ages. Maine and Michigan were selected as primary study states because both lowered their drinking age in the early 1970s

TABLE 1.3

Current Minimum Legal Drinking Ages: April 1981

State	Beer		Wine		Distilled Spirits
	3.2% or less alcohol	over 3.2% alcohol	Light	Fortified	
Alabama	19	19	19	19	19
Alaska	19	19	19	19	19
Arizona	19	19	19	19	19
Arkansas	21	21	21	21	21
California	21	21	21	21	21
Colorado	18	21	21	21	21
Connecticut	18	18	18	18	18
Delaware	20	20	20	20	20
District of Columbia	18	18	18	21	21
Florida	19	19	19	19	19
Georgia	19	19	19	19	19
Hawaii	18	18	18	18	18
Idaho	19	19	19	19	19
Illinois	21	21	21	21	21
Indiana	21	21	21	21	21
Iowa	19	19	19	19	19
Kansas	18	21	21	21	21
Kentucky	21	21	21	21	21
Louisiana	18	18	18	18	18
Maine	20	20	20	20	20
Maryland	18	18	18	21	21

State	Beer		Wine		Distilled Spirits
	3.2% or less alcohol	over 3.2% alcohol	Light	Fortified	
Massachusetts	20	20	20	20	20
Michigan	21	21	21	21	21
Minnesota	19	19	19	19	19
Mississippi	18[1]	21	18[1]	21	21
Missouri	21	21	21	21	21
Montana	19	19	19	19	19
Nebraska	20	20	20	20	20
Nevada	21	21	21	21	21
New Hampshire	20	20	20	20	20
New Jersey	19	19	19	19	19
New Mexico	21	21	21	21	21
New York	18	18	18	18	18
North Carolina	18	18	18	21	21
North Dakota	21	21	21	21	21
Ohio	18	21	21	21	21
Oklahoma	18[1]	21	21	21	21
Oregon	21	21	21	21	21
Pennsylvania	21	21	21	21	21
Rhode Island	20	20	20	20	20
South Carolina	18	18	18	18	21
South Dakota	18	21	21	21	21
Tennessee	19	19	19	19	19
Texas	18	18	18	18	18

State	Beer		Wine		Distilled Spirits
	3.2% or less alcohol	over 3.2% alcohol	Light	Fortified	
Utah	21	21	21	21	21
Vermont	18	18	18	18	18
Virginia	18[3]	18[3]	21	21	21
Washington	21	21	21	21	21
West Virginia	18	18[4]	18	18	18
Wisconsin	18	18	18	18	18
Wyoming	19	19	19	19	19

[1]Drinking age is 18 for beer or wine that is 4% or less alcohol by weight.

[2]Prior to December 1976, the age was 18 for females and 21 for males. This sex discrimination was ruled unconstitutional by the U.S. Supreme Court, having the effect of lowering the age to 18 for males [Craig v. Boren, U.S. Okl. 97 S. Ct. 451 (1976)].

[3]Eighteen for on-premise consumption, nineteen for off-premise consumption.

[4]Effective June 1980; beer over 3.2% was illegal in West Virginia before that date.

and returned to their original higher age in the late 1970s. As noted in Table 1.1, Maine lowered its drinking age from 20 to 18, effective June 9, 1972, and returned the legal age to 20, effective October 23, 1977. Similarly, Michigan lowered its drinking age from 21 to 18, effective January 1, 1972, and returned the legal age to 21, effective December 23, 1978. When the drinking age was raised, neither state included a "grandfather clause" whereby young people who could legally drink prior to the increase in drinking age would continue to possess that right. After the raised drinking ages went into effect, young

people who previously had the right to purchase alcoholic beverages no longer were legally allowed to do so.

The goals of this investigation were twofold. First, to provide objective information concerning the effect of the legal drinking age to policy-makers and voters who must continue to deal with this issue. A major concern in discussions of public policy on the legal drinking age is the extent to which modifications in the drinking age cause changes in the motor vehicle accident experience of young drivers. Therefore, this investigation emphasized the use of a research design with a high degree of interval validity, and included consideration of potential alternative explanations of the observed relationship between the drinking age and traffic accidents. In addition to the primary focus on motor vehicle accidents, the relationship between drinking age changes and aggregate beverage alcohol sales was also explored. The second goal of the present study was to use naturally occurring experiments with the minimum legal drinking age to test propositions based on emerging theories concerning the impact of beverage alcohol availability on alcohol consumption and alcohol-related public health problems.

2.0 ALCOHOL AND HIGHWAY SAFETY

A major component in the legal drinking age debate has been the impact of modifications of drinking age on alcohol-related motor vehicle collision experience of youth. Recent trends in youthful drinking patterns and the role of alcohol in traffic accidents, especially with reference to young drivers, are discussed below.

2.1 Drinking Patterns

It is well established that most young people in the United States regularly drink alcoholic beverages. Blane and Hewitt (1977) reviewed 120 surveys of adolescent drinking practices (i.e., youth aged 13 to 18) conducted since 1941. They concluded that the prevalence of youthful drinkers (i.e., "have you ever had a drink") was increasing prior to the mid-1960s, and that about 70 percent of junior and senior high school students were consistently identified as drinkers over the 1966 through 1975 period. A similar pattern was revealed for lifetime prevalence of intoxication (i.e., "have you ever been drunk"), which increased from 19 percent prior to 1966 to 45 percent during the 1966 to 1975 time period, remaining stable during the latter ten-year period. Prevalence of self-reported monthly intoxication (i.e., "how often do you become drunk") similarly increased from 10 percent before 1966 to about 19 percent during the 1966 to 1975 period, although the small number of surveys assessing prevalence of monthly intoxication limits the conclusions that could be made concerning trends in recent years. Blane and Hewitt also could not identify trends in drinking frequency among adolescents over the past two decades because of the inconsistent measures of drinking frequency used in various surveys. Their best estimate of average

drinking frequency among teenage drinkers age 13 to 18 was three drinking occasions per month.

Note that although these estimates were based on a comprehensive review of 120 surveys, only 14 of those studies used probability samples from clearly defined populations. As a result, estimates of the drinking practices of adolescents in the United States should be used with caution. Nevertheless, many studies over an extended period have indicated that the great majority of adolescents drink regularly and a substantial number also frequently become intoxicated.

The above discussion has been restricted to drinking practices of junior and senior high school youth. The literature on college students, also reviewed by Blane and Hewitt (1977), is even more limited. Existing surveys of college students indicate that the prevalence of drinkers (i.e., "have you ever had a drink") has been continually increasing since World War II. It is estimated that about 89 percent of all college students are drinkers. There are indications that the frequency of intoxication among college students has increased in the past quarter century. Furthermore, those age 18 to 25 consume more beverage alcohol than at any other period in the life cycle, and they drink larger quantities of alcohol per occasion than older drinkers (Blane and Hewitt, 1977; National Institute on Alcohol Abuse and Alcoholism, 1978).

The most recent information concerning youthful drinking practices was provided by the ongoing longitudinal nationwide probability surveys being conducted by Johnston, Bachman and O'Malley (Johnston et al., 1979a, 1979b). They reported that 88 percent of high school seniors surveyed in 1979 were at least occasional users of alcohol, 72 percent

reported use within the past month, and 41 percent reported consuming five or more drinks on at least one occasion in the previous two weeks. Furthermore, similar surveys conducted each year since 1975 revealed that, while the prevalence of drinkers has remained stable in recent years, the prevalence of high school seniors who frequently become intoxicated has increased over the past five years (from 37 percent in 1975 to 41 percent in 1979; Johnston et al., 1979b).[2]

These recent data confirm and extend the conclusion Blane and Hewitt made on the basis of their review of surveys conducted prior to 1975. That is, a plateau in the prevalence of drinkers among older adolescents and young adults has apparently been reached, with about 80 to 90 percent identifying themselves as drinkers. However, the prevalence of young people who frequently become intoxicated appears to be increasing, with current data indicating that more than one-third of young people in the United States become intoxicated at least once every 14 days. The experience of frequent intoxication by a sizeable proportion of American adolescents creates the potential for serious mortality and injury outcomes if young drinkers operate motor vehicles while in an alcohol-impaired state.

2.2 Traffic Accidents

Motor vehicle accidents are the leading cause of death among youth aged 15 to 24, claiming 18,900 lives in the United States in 1979 (National Safety Council, 1980). A large number of interacting factors have been identified as causes of traffic accidents.

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[2]These high prevalence rates of frequent intoxication were also found by Wechsler (1979), in his recent surveys of youthful drinking practices.

Intensive investigations of random samples of accidents conducted at Indiana University by the Institute for Research in Public Safety have revealed that vehicular factors (e.g. brake failures, tire blowouts) were a definite cause of the collision in about 5 percent of the cases; and environmental factors (e.g. slick roads, reduced visibility, roadway defects) were a definite cause in about 20 percent of the accidents examined (Institute for Research in Public Safety, 1975). Human direct causes (e.g. excessive speed, tailgating, driver inattention), on the other hand, were documented as a definite cause of the collision in over 80 percent of the accidents. The researchers emphasized the dominant role of human factors in accident causation, and pointed out that even in those cases where a definite vehicular or environmental cause was evident, it was most often a combination of such factors with human error that brought about the collision.

Human errors that cause most collisions are often a direct result of human conditions at the time of the crash (e.g. driver inexperienced, emotionally upset, fatigued, impaired by drugs). The multidisciplinary investigations of causes of traffic collisions mentioned above have revealed that, for samples of all accidents at all times, alcohol-impairment is the human condition most frequently identified as a causal factor in the crash; alcohol impairment was identified as a definite or probable cause in about 7 percent of the collisions investigated (Treat, 1977). It should be emphasized that the accident sample included all motor vehicle accidents at all times of the day/week; as a result, the great majority of the investigated collisions were relatively minor property-damage accidents occurring during daytime rush hours.

The epidemiological literature on the role of beverage alcohol in traffic accidents demonstrates that the role of alcohol increases as the severity of the accident increases. Although only about 10 percent of the drivers in minor property-damage accidents have blood alcohol concentrations (BACs) over .05 percent, about 15 percent of drivers involved in extensive property-damage accidents have BACs of .05 percent or greater, approximately 25 percent of drivers involved in serious injury accidents have BACs of .10 or greater, and the most serious accidents, fatalities, have the highest rates of alcohol impairment, with about one-half of the drivers having a BAC of at least .10 percent (Cameron, 1977; Jones and Joscelyn, 1978). The findings of these studies are supported by studies that include control groups, matched in time and place to samples of accidents. Such studies have found that the relative risk of being involved in a crash accelerates rapidly at BACs over .08 percent (Cameron, 1977; Jones and Joscelyn, 1978).[3]

A variety of individual characteristics (e.g. socio-demographic, attitudinal, personality, socio-environmental) predispose one to human conditions that often lead to driver error, which consequently results in a collision. Of all of the predisposing characteristics, age and sex of driver are consistently among the best predictors of accident involvement (Cameron, 1977). Young drivers (15 to 24), especially males, are overrepresented in all types of traffic accidents in most developed countries. Young drivers have accident rates from 2 to 10 times the rates for drivers of other age groups (Organization for Economic Cooperation and Development, 1975).

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[3]Relative risk is the probability of crash involvement at a particular BAC divided by the probability of crash involvement with a BAC of zero.

A variety of exposure variables have been suggested as explanations for the overrepresentation of youth among accident-involved drivers, esperially involvement in more serious injury-producing collisions, such as: (1) driving at more hazardous times/locations (for example, nighttime and weekends); (2) more frequent driving with passengers present (increasing the probability of distraction); (3) driving vehicles that are in poorer condition; and (4) more frequent use of two-wheeled vehicles. Although much work remains to be done concerning the effects of differential exposure, studies to date indicate that the overrepresentation of young drivers in the accident-involved population remains, even after a variety of controls on accident exposure (Organization for Economic Cooperation and Development, 1975; Preusser et al., 1975).

In addition to their overrepresentation in all collisions, young drivers also have the highest rates of alcohol-related crashes of any age group (Cameron, 1977; Flora et al., 1978).[4] The high rates of alcohol-related collisions among youth are apparently not due simply to increased driving after drinking. In fact, roadside breath test surveys have revealed that the proportion of youthful drivers with elevated BACs is the same as, or lower than, the proportion of drivers in their 30s or 40s with elevated BACs (Preusser et al., 1975; Wolfe, 1975).

An important explanation of the excessive rates of alcohol-related collision experience of young drivers is the finding that the relative risk of crash involvement at various BAC levels is higher for youth than the relative risk of crash involvement at the same BAC levels of middle-

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[4]Alcohol-related crash rate is here defined as the alcohol-related crash frequency divided by the total crash frequency for the relevant age group.

age drivers (Perrine et al., 1971; Zylman, 1972; Farris et al., 1975). Thus, a young driver with a given BAC level is more likely to be involved in an accident than an older driver at the same level, and the risk of a crash increases more sharply with increasing BAC levels for youth than for drivers of other ages.

The particularly high susceptibility to traffic crashes among youth as compared to older drivers at identical BAC levels may be due to the lack of extensive experience with drinking and driving after drinking among youth. Such an explanation was supported by the work of Hurst (1973) who reported that, among drinkers of all ages, those who drink infrequently have a higher relative risk of crash involvement at a given BAC level than frequent drinkers. Thus, although youth have been characterized as frequent heavy drinkers (Blane, 1979), their recent initiation into regular drinking may not have afforded them sufficient experience with drinking effects and driving after drinking for the development of compensatory actions that reduce the risk of an alcohol-related collision. A second explanation for the particularly serious effect of an elevated BAC on the risk of crash involvement among youth is that alcohol exacerbates the pre-existing impulsiveness and propensity toward risk taking behavior characteristic of adolescents and young adults (Klein, 1971; Pelz and Schuman, 1971; Makela, 1978).

2.3 Summary and Conclusions

The literature on motor vehicle accidents has revealed that, of the multiple environmental, vehicular, and human causes of collisions, human error is the central cause of most traffic accidents. These human errors are frequently a result of the alcohol-impaired condition of the driver. Drinking patterns of young people, characterized by a high

prevalence of drinkers who regularly consume large quantities of alcoholic beverages per occasion, and increased sensitivity to impairment at a given BAC level of young drivers as compared to older drivers, combine to make them particularly susceptible to alcohol-related crash involvement. The combination of (1) high rates of motor vehicle collisions regardless of alcohol involvement (reflecting inexperience with driving), with (2) the highest proportion of all accidents involving alcohol of any age group (reflecting inexperience with drinking), indicates that young drinking drivers are an appropriate high-risk target group for the prevention of death and injury resulting from alcohol-related traffic accidents. The legal minimum drinking age has been identified as one potential mechanism that can be used as part of these prevention efforts.

3.0 ALCOHOL AVAILABILITY AND THE MINIMUM LEGAL DRINKING AGE

3.1 Alcohol Availability

Laws and regulations affecting the availability or accessibility of alcoholic beverages, of which the minimum drinking drinking is one example, have attracted increasing attention in recent years as a strategy for the prevention of alcohol-related problems. As discussed in considerable detail by Beauchamp (1980), since the repeal of prohibition, alcohol-related problems have been viewed as symptoms or consequences of a specific disease called alcoholism. With the emergence of a medical treatment establishment and groups like Alcoholics Anonymous focusing on those addicted to alcohol, individuals experiencing alcohol-related health and social problems were viewed as alcoholic or pre-alcoholic. While the specific etiology of alcoholism remained poorly understood, it was generally thought that those experiencing alcohol-related problems possessed a particular constellation of physiological or psychological traits that made them susceptible to the disease. The concept of alcoholism, by implication, proclaimed alcohol to be non-problematic for society at large, and for most beverage alcohol consumers.

One result of the dominance of the disease concept of alcoholism was a lack of attention to the role of laws and regulations in controlling alcohol use and associated social and health problems. If all alcohol-related problems are a result of the disease of alcoholism, which strikes certain individuals because they have particular traits that most people do not have, then public policy affecting alcohol availability is simply irrelevant when attempting to reduce the prevalence or incidence of alcohol-related problems. If acute public

health problems such as accident morbidity and mortality are seen as symptomatic of alcoholism, solutions are focused on defining, identifying, and treating alcoholics, not investigating the effects of controls on alcohol availability. As a result, very little empirical research on the effects of alcohol control laws was conducted in the United States between 1930 and 1970.

One important exception to the absence of inquiry into the alcohol control law area was a series of papers produced by the Moreland Commission of New York State in 1963 (New York State, 1963, 1964; Bacon, 1971). The Commission concluded that, in general, extant beverage control laws did not have beneficial effects in reducing alcohol problems, and recommended relaxing restrictions on the marketing of alcoholic beverages. Although of limited scientific merit, and with admittedly poor data, the Commission's conclusions were accepted for several years, with the result that little detailed examination of beverage control laws was conducted during the subsequent decade.

During the 1970s and early 1980s, alcohol availability issues received increasing research attention, particularly in Europe and Canada, but also in the United States (Bruun et al., 1975; Wong, 1979 Harford et al., 1980; Moser, 1980; Frankel and Whitehead, 1981). Although U.S. studies in the 1970s focused on effects of specific availability changes such as the drinking age, by late in the decade the role of general alcohol availability was receiving more attention. Reports by the federal government discussed the potential of alcohol beverage control laws as one strategy for the prevention of alcohol-related problems (National Institute on Alcohol Abuse and Alcoholism, 1978; Alcohol, Drug Abuse, and Mental Health Administration, 1981). As

a result, the role of alcohol availability and alcohol beverage control laws is receiving increasing attention among researchers and policy makers.

Although research on alcohol availability is increasing, a focus on alcoholism and chronic heavy drinking continues. Most recent research on relationships between public policy, alcohol availability, alcohol consumption, and alcohol-related public health problems has used cirrhosis mortality as the dependent variable. The effects of changing alcohol availability by lowering or raising the legal minimum age for purchase of alcoholic beverages is one area where the focus has been on acute alcohol problems, particularly traffic accidents.

3.2 Recent Research on Effects of Changes in Legal Drinking Age

As a result of the drinking patterns of young people, characterized by frequent intoxication, and the high rate of alcohol-related traffic accidents among young drivers, a major issue in the controversy surrounding drinking age has been the impact of changes in legal drinking age upon the incidence of motor vehicle accidents among young drinkers. After many states and Canadian provinces lowered the legal drinking age in the early 1970s, numerous evaluations were conducted of the impact of legal changes on the frequency of involvement in motor vehicle collisions among young drivers. Most of the investigations were based on comparisons between indices of youthful crash involvement before and after a reduction in legal drinking age took effect.

In addition to such pre-change post-change comparisons of crash involvement among youth within the state or province experiencing a reduction in drinking age, numerous studies included an assessment of pre-and-post-legal-change crash involvement for (A) comparison age

groups not directly affected by the legal change (such as drivers over age 21), or (B) comparison jurisdictions that had not experienced a contemporaneous change in legal drinking age.

3.2.1 Lowered Drinking Age and Traffic Accidents. Williams et al. (1974) examined fatal traffic accident frequencies among 15-17 and 18-20-year-old drivers in Michigan, Wisconsin, and Ontario, where the legal drinking age had been lowered. Fatal accident frequencies for three years prior to and one year after the legal changes were compared to the contiguous states of Indiana, Illinois, and Minnesota, respectively, where the drinking age had not been lowered during the time period studied.

Significant increases in fatal crash frequencies were found for both the 15-17 and 18-20 age groups in the jurisdictions experiencing a legal drinking age reduction. Separate analyses of single-vehicle and nighttime fatal crashes, of which a large proportion are known to be alcohol-related, revealed larger increases in frequency than analyses of all fatal crashes. The observed increases in fatal crash involvement among youth were substantially larger for Michigan and Ontario than for Wisconsin. The smaller effect for Wisconsin was most likely a result of the less drastic change in the legal availability of alcohol. In Wisconsin prior to the legal change, 18-20-year-olds could legally purchase beer; the new law simply extended that right to all types of alcoholic beverages.

Naor and Nashold (1975) also studied the impact of the Wisconsin legal change upon highway fatalities. Although the frequency of alcohol-related fatalities did increase concomitant with the legal change, the proportion of all fatally injured drivers having elevated

blood alcohol levels did not change significantly.[5] Naor and Nashold used the latter finding to argue that the reduced drinking age had no effect on traffic accidents among youth. However, since beer, the beverage of choice among young people, was legally available prior to the drinking age change evaluated, this investigation cannot be considered a valid test of the effects of a lowered legal drinking age.

Cucchiaro et al. (1974) evaluated the impact of reduced drinking age in Massachusetts using monthly time-series of traffic accidents. Traffic accident time-series were examined for the age groups 15-17, 18-20, 21-23, and 24 and over. The 18-20-year-old driving population experienced significant increases in total fatal crashes, alcohol-related fatal crashes, and alcohol-related property damage accidents, after the drinking age was lowered. None of the accident measures changed significantly for the 21-23 and 24-and-over drivers.

Douglass (1974), also using monthly time-series of motor vehicle crash involvement, assessed the impact of reduced drinking ages in Maine, Michigan, and Vermont. Collision involvement of 18-20 or 18-19-year-old drivers in these states was compared with collision involvement of 21-45-year-old drivers within the same state, and with 18-20-year-old drivers in Louisiana, Pennsylvania, and Texas, states which held the drinking age constant over the study period. Time-series analyses revealed significant increases in alcohol-related crash frequencies among the 18-20-year-old population in both Michigan and Maine. No significant increases in alcohol-related crash frequencies among youth were observed in any of the comparison states, nor were there any

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[5]Only fatalities for which a blood alcohol concentration test was administered were used in these analyses.

significant shifts for 21-45-year-old drivers within the experimental states. Douglass suggested that the lack of significant changes in traffic crash frequency in Vermont, which also lowered its drinking age, may have been a result of the relative ease with which 18-20-year-olds in Vermont could obtain alcoholic beverages prior to the reduced drinking age by driving to New York, which has had a drinking age of 18 since 1934.

Douglass and Freedman (1977) replicated some of the earlier analyses, using four years of observations after the legal change. According to the authors, the results demonstrated that the increase in alcohol-related crash involvement among Michigan youth, identified in the 1974 research, persisted over the four years after the reduced drinking age took effect (i.e., 1972 through 1975). Evaluation of the Michigan experience continued with Flora et al.'s (1978) analyses of fatal accidents in Michigan from 1968 through 1976. Although these authors did not use the same analytical techniques as Douglass, the impact of the 1972 reduction in legal drinking age upon alcohol-related traffic accidents among youth was again demonstrated.

An increase in alcohol-related collisions was also reported by Schmidt and Kornaczewski (1975), who examined yearly accident data for Ontario from 1967 through 1971. Although lack of monthly data and the inability to analyze separately only 18-20-year-old drivers made this study a conservative test of the effects of a reduced drinking age, the researchers found a significant increase in crash involvement among 16-19-year-old drivers after the law changed.

Whitehead et al. (1975) examined the crash involvement of 16-20 and 24-year-old drivers in London, Ontario, for the 1968 through 1973 time

period. Increases of 150 to 300 percent in alcohol-related crashes among drivers age 18-20 were evident after Ontario's drinking age was lowered.[4] In contrast, 24-year-old drivers experienced only a 20 percent increase in alcohol-related crashes for the first year after the legal change, with their collision frequency returning to the pre-change level the second year after the reduced drinking age took effect. In a followup study, Whitehead (1977) examined an additional two years of collision data. A total of four years of crash involvement data after the reduction in drinking age demonstrated the permanence of the increased alcohol-related collision frequency documented in the 1975 investigation.

Warren et al. (1977) evaluated the impact of reduced drinking ages in Alberta, Manitoba, New Brunswick, and Saskatchewan on traffic fatalities between 1968 and 1975. Only those fatalities for which a blood alcohol concentration test was administered were included in the analyses. Frequency of alcohol-related fatalities for 15-20-year-old drivers before and after a reduction in drinking age were compared within each province. Some increases in fatalities among 15-20-year-old drivers were observed within the study jurisdictions at the time the drinking age was lowered. However, since blood alcohol concentration legally defined as drunk driving was reduced to .08 percent at about the same time that drinking ages were lowered, Warren et al. pointed out that the effects of the .08 legislation were confounded with the effects of lower legal drinking ages. Furthermore, insufficient numbers of pre-change observations were available to control adequately for the stochastic error in traffic fatality time-series. According to Warren

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[4]Police reports were used as indicator of alcohol involvement.

et al., although increases in fatalities among youth occurred after the drinking age was lowered, one is not able to conclude that the increases were due to drinking age changes.

One of the provinces investigated by Warren et al., Saskatchewan, was also studied by Shattuck and Whitehead (1976). After the drinking age was lowered from 21 to 19 in April 1970, 16-20-year-old drivers exhibited 20 to 50 percent increases in alcohol-related crashes.[1] After drinking age was lowered from 19 to 18 in June 1972, 16-18 year old drivers experienced further increases in alcohol-related collision involvement. Thus, two reductions in the legal drinking age were associated with increased alcohol-related crash involvement among both the newly enfranchised drinkers and the underage population.

Bako et al. (1976) examined the frequency of drivers with blood alcohol concentrations of .08 percent or greater among those fatally injured in the province of Alberta. An increase of 118 percent was observed in incidence of alcohol-related fatal collisions among 15-19 year-old drivers after the drinking age was lowered. The researchers concluded that their findings support the argument that lowered drinking ages lead to increased alcohol-related collisions among youth.

The reduction in legal drinking age for beer and wine in Illinois (from 21 to 19) was evaluated by the Illinois Department of Transportation (1977). Comparisons between fatality incidence in Illinois and five control states were used as the basis for the conclusion that the lowered drinking age in Illinois caused a 1.6 percent increase in fatalities among drivers age 19 and 20.

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[1]Police reports were used as indicator of alcohol involvement.

The National Institute on Alcohol Abuse and Alcoholism's Alcohol Epidemiologic Data System (1980) examined annual traffic fatality counts in the 50 states from 1970 through 1978. The authors concluded that ". . .differences in highway fatalities with the change in drinking laws do not appear significantly large." The authors readily admit, however, that their analyses did not adequately control for the effects of several confounding factors that occurred in the 1970s (e.g. fuel shortages, speed limit reductions, etc.).

After Alabama lowered its drinking age from 21 to 19 in 1975, alcohol-related crashes increased significantly among drivers age 18-20, according to Brown and Maghsoodloo (1981). Koch (1981) points out the methodological limitations of Brown and Maghsoodloo's study, and argues that it does not establish a causal connection between the drinking age and crashes, because the study did not include adequate comparisons between alcohol-related and non-alcohol-related crashes and between states that changed the drinking age and those that did not. However, the association between lowered drinking age and increased alcohol-related crashes in Alabama is consistent with the results from studies of other states, and provides additional support for the conclusion that lower drinking ages increase alcohol-related traffic crashes.

Lynn (1981) analyzed annual counts of alcohol-related crashes in Virginia from 1969 through 1979. Drivers age 16-20 experienced an identifiable increase in alcohol-related crash involvement beginning in 1974 when the drinking age for beer was lowered to 18. In contrast, drivers 25 and over experienced a decrease in alcohol-related crashes during the same period. The author concluded that the lowered drinking age was responsible for increased alcohol-related crashes among young

drivers in Virginia in the late 1970s, and recommended a gradual return to the 21-year-old drinking age.

It is evident from the literature reviewed here that most of the investigations of the impact of lowered legal drinking ages on motor vehicle collision involvement have found significant increases in crash involvement frequencies among previously underage drivers who acquired the right to drink under the new laws (usually 18-20-year-old drivers). A number of studies have also demonstrated substantial increases in crash involvement among underage drivers (usually 16 and 17 years old) following reductions in minimum drinking age. Consistency of the results leads to the conclusion that lowered drinking ages result in increased highway safety problems among youth.

The view that lower legal drinking ages cause increased youthful crash involvement is not universally held, with Zylman a well-known opponent of a causal interpretation of the observed relationships. Zylman (1973, 1974, 1976, 1977) has criticized several of the studies reviewed above. He argues that observed increases in alcohol-related crash involvement among youth after the drinking age was lowered were not due to the drinking age change, but rather were a result of (1) random fluctuations in traffic accident time-series, (2) the continuation of trends of increasing alcohol consumption (and alcohol-related accidents) among youth evident prior to the legal changes, or (3) increased attention to alcohol-related traffic offenses by law enforcement officers. However, those studies explicitly controlling for both long-term trends and random fluctuations have also found effects of the lower drinking age. Secondly, although Zylman correctly points out the danger in relying on analyses of police-reported alcohol

involvement, lowered drinking age effects (although of smaller magnitude than analyses based on police reports) have been observed using alternative measures of alcohol-involvement not influenced by police reporting practices, such as analyses of single-vehicle, nighttime, and weekend crashes.

3.2.2 Raised Drinking Age and Traffic Accidents. In addition to the evaluations of the lowered drinking age, there are several early reports on effects of raising the drinking age. Roy and Greenblatt (1979) compared the number of teenagers charged with driving under the influence of liquor (DUIL) appearing in Massachusetts courts before the legal age was raised with similar data for a one-month period after the drinking age change.[8] Small increases in youthful DUIL arrests were used to conclude that the raised drinking age led to increased drinking-driving problems among youth. This study, however, does not merit serious attention because of the following serious flaws in its design and data analyses: (1) DUIL arrests are an inadequate measure of alcohol-related highway safety hazards because young drivers are more likely than older drivers to be involved in an alcohol-related crash, but less likely to be arrested for DUIL (Organization for Economic Cooperation and Development, 1975);[9] (2) the design is a one-group pretest-posttest, inherently characterized by low internal validity because of its lack of a control group and an extended time-series of observations (Cook and Campbell, 1979); (3) related to the basic

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[8]The Massachusetts legal drinking age was raised from 18 to 20 on April 16, 1979. The pre-post comparison was the number of DUIL arrests in February 1979 versus the number in October 1979.

[9]In addition, subjective considerations are more likely to influence whether a particular drinking-driver is arrested than whether a drinking-driver is crash-involved.

inadequacy of the design is the lack of any statistical control on time-ordered trends, seasonality, or random fluctuations in the frequency of DUIL arrests. As a result, this study provides little useful information concerning the effects of a raised drinking age.

Another study of the higher drinking age in Massachusetts, with substantially better design and analysis methods, was conducted by Hingson et al. (1981). Analyses of fatal crashes among young drivers revealed no permanent effect of the higher drinking age. Self-reports (via telephone interviews) of quantity of alcohol drunk and driving-after-drinking behavior among young people did not change substantially as a result of the new law.

Filkins and Flora (1981), using a partitioned chi-square statistical analysis technique, analyzed youth crash involvement and frequency of arrest for Driving Under the Influence of Liquor (DUIL) in Michigan. Significant reductions both in crash involvement and DUIL arrests among 18-20-year-old drivers were found after the drinking age was raised. The authors concluded that the minimum legal drinking age "clearly influences" the drinking-driving patterns of young people.

Wagenaar (1980, 1981) analyzed a 20% random sample of all reported motor vehicle accidents in the State of Michigan between January 1972 and December 1979. Using a multiple time-series design, the frequency of alcohol-related crashes among young drivers was compared to the frequency of non-alcohol-related crashes, and the crash involvement of young drivers was compared with that of older drivers. Results showed an estimated 18% reduction in alcohol-related crash involvement among young drivers was associated with Michigan's increase in drinking age.

Williams et al. (1981) analyzed fatal crash involvement in nine states that raised the drinking age, comparing them to adjacent states with unchanged drinking ages during the period studied. Eight of the nine states experienced decreases in youth fatal crash involvement after the drinking age was raised. The authors concluded that raising the drinking age in any given state should result in a 28% reduction in nighttime fatal crash involvement among the age group affected by the legal change.

In summary, of the studies conducted to date on the effect of returning to higher drinking ages, most found significant reductions in drinking-driving or alcohol-related crash involvement after states raised the drinking age. The two studies that found no effect of a higher drinking age both examined the experience in Massachusetts. Furthermore, in Williams et al. (1981) study of fatal crashes in nine states, the estimated fatal crash reduction in Massachusetts was only 6%, a non-significant difference. Without further research, it is not clear why the Massachusetts experience with a raised drinking age was different from that in all of the other states examined to date.

3.2.3 Drinking Age and Alcohol Consumption Among Youth. Existing literature on the effects of changing the drinking age on youthful alcohol consumption has focused on three main types of alcohol consumption data: (1) self-reported consumption, (2) perceptions of youthful consumption patterns reported by school officials, and (3) aggregate sales volumes. Wolfe and Chapman (1973a, 1973b) surveyed Michigan high school students in 1971 before the drinking age was lowered, and again in 1973 after the reduction in drinking age, and found substantially increased frequency of drinking, and increased

quantity consumed per occasion. According to the authors, the increases were consistent with pre-existing trends in youthful alcohol use, and therefore could not be unambiguously attributed to the lowered legal drinking age.

Smart and Schmidt (1975) conducted a similar before and after survey of Toronto junior and senior high school students. After a reduction in the drinking age, 41 percent of the students reported no change in drinking patterns, 20 percent reported drinking more, 4 percent reported drinking less, and 9 percent indicated that they had started drinking since the drinking age had been reduced. Smart and Schmidt also surveyed college students, the majority of whom reported no change in frequency or quantity of alcohol consumption, although 55 percent did report increased patronization of public drinking establishments since the legal change.

McFadden and Wechsler (1979) surveyed Massachusetts teenagers in 1965, 1970, and 1974. Youthful alcohol consumption increased between 1965 and 1970, when there was no change in the drinking age, as well as between 1970 and 1974, when there was a reduction in the legal age from 21 to 18. The authors also surveyed New England college students in 1977, and found that students from states with a low legal drinking age consumed alcohol more frequently than students from states with a high drinking age.

Rooney and Swartz (1977) surveyed high school students in three selected states with minimum legal drinking ages at 18, and two selected states with drinking ages at 20 and 21, respectively. The samples were not demonstrably representative of the high school age population in the states examined. They found that 42 percent of the responding students

In states with the drinking ages at 20 or 21, and 47 percent in states with the drinking age at 18, reported consuming beer once a week or more. Furthermore, students in states with a high drinking age had a lower prevalence of abstainers (19 versus 24 percent), and a higher incidence of alcohol-related problems. The authors concluded that a high drinking age has no beneficial effect in controlling alcohol consumption among young people, and that it may even have adverse effects.

Opposite results were obtained by Maisto and Rachal (1980) in their analyses of a nationwide probability sample of high school students. They found that students in states with a higher legal drinking age were more likely to be abstainers, less likely to be heavy drinkers, and experienced intoxication less frequently than students in states with a lower drinking age. The authors concluded that the legal availability of beverage alcohol, as reflected in the drinking age, is associated with the drinking practices of young people.

Perceptions of school officials have also been used as an indicator of changes in youthful alcohol consumption concomitant with lowering the drinking age. Hammond (1973), questioning 354 Michigan high school principals, found that the majority reported more drinking among 15-17 year-old students after the drinking age was lowered. A similar survey in the Toronto area found that vice-principals reported more drinking among students at school functions after the drinking age was lowered (Smart and Schmidt, 1975).

The third major type of data that has been used to assess the impact of reduced drinking ages on alcohol consumption patterns is aggregate sales volumes. Smart and Schmidt (1975), in a comparison of

Ontario beverage alcohol shipments before and after a reduction in the legal age, found that consumption in the first five months after the legal change was higher than expected on the basis of the pre-change figures. Increased alcohol sales were particularly noticeable for on-premise sales, strengthening the argument that the lowered drinking age was at least a partial cause of the observed changes.

Barsby and Marshall (1977), examining aggregate distilled spirits sales in 25 states, did not identify any significant impact of lowered legal purchase ages on spirit sales. The authors temper their conclusions, however, by noting four limitations of their study. First, any change in distilled spirits consumption by youth following drinking age changes would have to be substantial before the impact would be seen in the aggregate statistics. Second, very little is known about changes in consumption patterns after legal changes; a change in location or quantity consumed per occasion resulting from the lowered drinking age, for example, could have significant adverse health consequences, independent of the total quantity consumed. Third, the analyses applied only to distilled spirits, not beer or wine, which are more popular beverages among young drinkers. Fourth, the time-span covered by the study was short, including only one year before and one year after the legal changes.

Douglass and Freedman (1977) avoided the last two design limitations of Barsby and Marshall's study by examining the monthly aggregate sales of draft beer, packaged beer, wine, and distilled spirits in Michigan over an eight year period. A statistically significant increase in draft beer sales was associated with lowering the drinking age. The authors attributed the shift in draft beer sales

to the lowered drinking age, since no other confounding factors were identified that could have plausibly accounted for the observed relationship. No significant shifts were identified for any of the other beverage categories.

Smart and Goodstadt (1977) discussed a study conducted by Smart and Finley in which per capita beer consumption in ten Canadian provinces was examined. Eight provinces that lowered their drinking ages were compared with two that had not changed during the study period. Although increased beer sales were evident in the pre/post comparisons for three provinces experiencing a reduction in the drinking age, the increases were similar in magnitude to the experience of the two control provinces. Moreover, beer sales decreased in the other five provinces. Smart and Goodstadt conclude that the study's findings do not allow any general conclusion as to the effect of lowered drinking ages on total beer sales.

Finally, Smart (1977) compared sales of beer, wine, and distilled spirits in 25 states which reduced the drinking age with 25 states with unchanged drinking ages. Although no significant differences between the states were identified for wine or distilled spirits, increases in beer sales were about six percent greater in the states with lowered drinking ages than states with an unchanged legal age.

3.2.4 Summary and Conclusions A review of the literature on effects of changed legal drinking ages clearly indicates that there is an inverse relationship between the minimum age for purchase and consumption of alcoholic beverages and alcohol-related motor vehicle crash involvement among young drivers. In contrast, the literature concerning effects of changing the legal drinking age on beverage

alcohol consumption among youth has significant methodological limitations and provides inconsistent results.

3.3 Model of Effects of the Legal Drinking Age

The impact of legal drinking age changes on traffic crash involvement is not direct, but rather is mediated by a variety of intervening variables. A model of the mechanism through which changes in legal drinking age cause changes in traffic crash involvement is presented in Figure 3.1. It is proposed that changes in legal drinking age influence drinking behavior and alcohol-related crash involvement by causing: (A) changes in social norms concerning youthful drinking, (B) changes in marketing activities of the beverage alcohol industry, and (C) changes in availability of alcohol to the target age group. Drinking norms change due to the symbolic function of the law (Bonnie, 1980; Mosher, J. F., 1980); that is, a reduction in legal drinking age may be perceived as an indicator that alcohol use is acceptable or even encouraged for young people. As a result, new patterns of drinking are established; young people who were non-drinkers or only occasional drinkers before the lowered drinking age experience increased social pressure to drink, as more of their friends and associates increase their drinking, and as they participate in more social situations in which beverage alcohol is an integral part. Such changes in drinking norms, according to the model, result in increased drinking among 18-20-year-olds after a reduction in drinking age. A higher drinking age is expected, to have opposite effects, symbolizing society's disapproval of youthful drinking, causing the reduction or elimination of certain drinking patterns (bar and tavern drinking, for example), and causing a reduction in social pressure to drink, since alcohol is present in fewer

social situations. Empirical support for these propositions is provided by Maisto and Rachal (1980), who analyzed data on a nationwide sample of high school students and found that youth in states with higher legal drinking ages report less peer approval of drinking and less perceived drinking among peers than students in states with lower drinking ages.

Marketing activities of the beverage alcohol industry are also expected to depend on legal drinking age. One would expect a low drinking age to result in advertising campaigns and location/design of drinking outlets oriented toward the youthful drinking population (for example, locating additional establishments with entertainment near college campuses). A higher drinking age is expected to reduce such marketing practices designed to encourage youthful drinking.

Changing the legal drinking age also results in altered availability of beverage alcohol to the affected population. The concept of beverage alcohol availability has numerous dimensions and has been defined in many ways (for example, physical availability, economic availability, and legal availability). For present purposes availability will be broadly defined as the ease with which alcoholic beverages can be obtained. On an individual level, availability of alcohol is an inverse function of total costs (monetary and non-monetary) of physically obtaining alcohol. These costs include: (A) nominal price of alcoholic beverages, (B) search costs involved in obtaining alcohol, such as value of the time expended and costs of any transportation required, and (C) risks associated with obtaining alcohol, a function of the perceived magnitude of potential disutilities accompanying attempts to acquire and use alcohol, and the perceived probability of experiencing such disutilities.

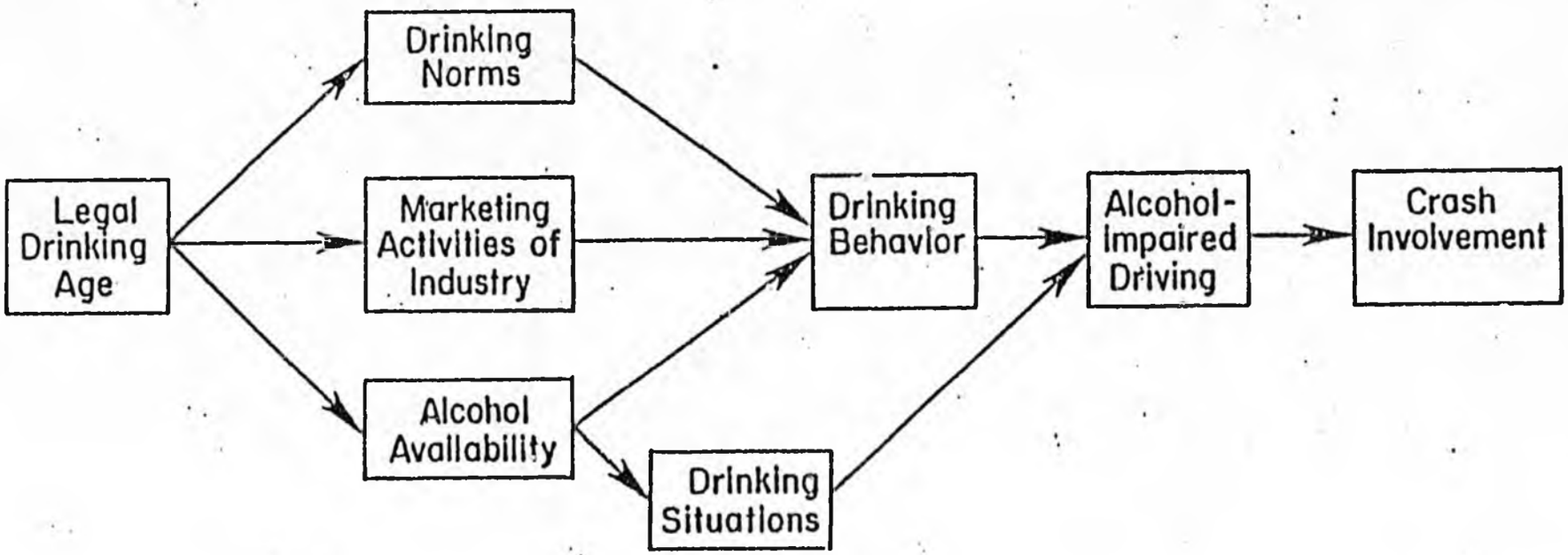


Figure 3.1 Model of the Impact of Changes in the Legal Drinking Age on Motor Vehicle Crash Involvement

Social policy at the aggregate level, such as a change in lega minimum drinking age, is expected to influence a number of th components of total cost of obtaining alcohol by underag individuals. The nominal cost of alcohol may increase with a raise drinking age as a result of a premium charged by those who suppl alcohol illegally to underage drinkers. A raised drinking age is likel to increase the search costs (since there are fewer suppliers), an increase the risks associated with apprehension and processing by th law enforcement system.

The legal drinking age does not totally determine the availabilit of alcohol to underage drinkers, since numerous other aspects of bot public policy and the private market of alcoholic beverages influenc availability. What is argued here is simply that the legal drinking ag is a significant influence on the ease with which alcoholic beverage can be obtained by young drivers. Support for this proposition i provided by cross-sectional surveys of high school students, which hav revealed that young people residing in states with lower legal drinkin ages are more likely to report that they can "obtain alcoholic beverage when they want them" than youth in states with higher drinking age (Maisto and Rachal, 1980).

Returning to the overall model in Figure 3.1, increased o decreased frequency of alcohol consumption and quantity consumed pe drinking occasion, caused by changed social norms, marketing activities and alcohol availability, are expected to increase or decrease th amount of alcohol-impaired driving, and consequently, increase o decrease the frequency of alcohol-related collision involvement amor drivers in the affected age group. Maisto and Rachal (1980) provic

preliminary findings concerning the effect of such factors intervening between a legal drinking age change and alcohol-related crash involvement outcomes. Their analyses led to the conclusion that there was less alcohol consumed less frequently by students in states with higher drinking ages than in states with lower drinking ages. Furthermore, questions on driving after drinking revealed that students in states with higher drinking ages report less frequent driving after drinking than students in states with lower drinking ages.

In addition to the impact of changes in availability of alcohol on the quantity-frequency of alcohol consumed, changes in availability resulting from legal drinking age modifications are also likely to lead to important changes in the situations in which drinking takes place. Lowering the drinking age results in increased drinking in bars and taverns by the age group. Since private automobiles are likely to be the usual mode of transportation to and from such public drinking places, lowering the drinking age can be expected to increase the frequency of driving after drinking among the 18-20 age group. With regard to the effect of a raised drinking age, supporters of the lowered age have argued that raising the legal age of drinking will cause replacement of bar and tavern drinking with drinking in automobiles while driving, increasing the alcohol-related crash risk of the age group. An alternative plausible hypothesis is that a raised drinking age will result in a larger proportion of the drinking by 18-20-year-olds occurring at private parties. Since, in contrast to a public drinking house, participants are not as likely to be compelled to leave at a specific hour and drive home, the incidence of alcohol-related crashes might be lower with a raised drinking age. This hypothesis remains

plausible even if one assumes that a raised drinking age has no impac on the overall quantity-frequency of alcohol consumed.

In short, changes in legal drinking age, according to the mode presented in Figure 3.1, are expected to result in changes in drinkin norms, industry marketing practices, alcohol availability, and th situations in which drinking takes place, all of which influenc drinking-driving behavior of the 18-20-year-old age group. Note tha this model illustrates plausible mechanisms by which the legal drinkin age influences alcohol-related crash involvement frequencies. Severa other socio-cultural, political, social-psychological, and situationa exogenous variables are likely to have a causal impact on all of th variables in the system depicted in Figure 3.1. The purpose of th model is not to provide a comprehensive theory concerning drinkin behavior and driving behavior, but only to indicate the potential causa factors mediating the impact of legal drinking age changes on th frequency of traffic accidents among youth. Although empirical evidenc for the specific intervening variables postulated here is scant, earl results of surveys of youthful drinking practices generally support th model (Maisto and Rachal, 1980). Further research examining th specific causal mechanisms through which legal changes influence cras outcomes is necessary.

3.4 Specific Research Questions

The core purpose of this investigation was to determine the effec of raising the minimum legal alcohol purchasing age on the frequency o alcohol-related crash involvement among young drivers. It could b argued that the raised drinking age also affected alcohol-related cras involvement among underage drivers (16-17), since the altered norms

marketing practices, and availability of beverage alcohol resulting from a changed drinking age may also influence drinking behavior of the proximal peers of the directly affected age group. It is reasonable to suppose that changed marketing practices and social norms concomitant with changes in drinking age would alter the visibility and acceptability of using alcohol among 16-17-year-olds as well as 18-20-year-olds. Furthermore, the availability of alcohol to 18-20-year-olds is likely to influence the ease with which youth age 16-17 obtain alcoholic beverages, since a prime source of alcohol for 16-17-year-old drinkers is likely to be older friends and associates with greater access to alcohol. Therefore, the effect of the raised drinking age on alcohol-related crash involvement of 16-17-year-old drivers was also analyzed. Because of the indirect nature of the impact of the legal drinking age on the collision experience of underage drinkers, however, the magnitude of the effect on underage drinkers was expected to be smaller than the effect on 18-20-year-old drivers. Furthermore, the impact on underage drinkers was expected to evolve over a longer period of time after a legal change than the impact on 18-20-year-old drivers, since a large portion of the effect of legal changes on underage drinkers is due to prior changes in drinking norms and practices among 18-20-year-olds.

A differential effect magnitude was also expected between a lowered and raised drinking age. It is usually much easier to change a person's pattern of behavior (here, alcohol consumption and drinking-driving) by adding new behaviors, without requiring a change in existing habits and established behavioral patterns, than it is to change personal behavior by requiring one to change or eliminate already established behavioral

patterns. Consequently, one would expect a lowered drinking age, allowing (and perhaps encouraging) new drinking patterns to supplement pre-existing drinking or non-drinking patterns, to have a noticeably greater effect than a raised drinking age, restricting already established drinking patterns that have become a part of one's day-to-day activities. In short, it is easier to learn a new behavior than to unlearn an old one. Therefore, results of this research, in conjunction with results of previous research on effects of the lower drinking age, were used to determine whether raising the drinking age has the same magnitude of effect as lowering the legal age; that is, whether raising the drinking age reduced alcohol-related crash involvement as much as lowering the drinking age increased crash involvement.

A major intervening variable between legal drinking age change and crash involvement shown in Figure 3.1 is drinking behavior. One mechanism by which the drinking age is expected to influence alcohol-related crash involvement is by reducing the total quantity of alcoholic beverages consumed by young drivers, and as a result reducing alcohol-impaired driving. Therefore, another goal of the present investigation was an assessment of the extent to which the raised drinking age affected aggregate sales of alcoholic beverages.

4.0. METHODS

This chapter describes the methods selected to measure effects of changes in legal drinking age in Maine and Michigan. Methodological issues discussed include: (1) the quasi-experimental design used, (2) operationalization of the dependent variables (i.e., traffic crash involvement and alcohol consumption), (3) overall design validity of the study, and (4) time series statistical data analysis techniques.

4.1 Research Design

The preferred design for inferring a causal relationship is the true experimental design in which the subject population is randomly assigned to two or more treatment conditions. In the present study this would mean comparing young drivers randomly assigned to a condition of legal availability of beverage alcohol (lower drinking age), to young drivers randomly assigned to a condition of no legal availability of beverage alcohol (higher drinking age). Since such random assignment was impossible, a quasi-experimental design had to be used (Campbell and Stanley, 1966; Cook and Campbell, 1976, 1979). Of the numerous quasi-experimental designs in use, the nonequivalent multiple time-series design rules out the largest number of plausible alternative explanations for a postulated causal relationship. The design involves a comparison of a series of observations over time expected to be affected by the intervention, with comparison series not expected to be affected. In this research, the postulated causal relationship is between changing alcohol availability (i.e., changing the legal drinking age) and traffic accidents. The design, as implemented in the present investigation, can be diagramed in its simplest form as shown in Figure 4.1, where each O_i represents the number of crash involvements in a

particular month, I represents raising the drinking age, n_1 is the number of monthly observations before the drinking age was raised, and n_2 is the number of monthly observations after the drinking age was raised. The second row in the design diagram represents a comparison time series, not influenced by the intervention included in the first row.

Although the simple diagram shown in Figure 4.1 depicts only one experimental and one comparison series, multiple measures of motor vehicle crash involvement and multiple comparison groups were included in the design. The broadest of the three levels of comparison included in the design was analyses of four different states (Figure 4.2), two that had raised the drinking age in the late 1970s (Maine and Michigan), and two with no such legal changes (New York with a consistent drinking age at 18 and Pennsylvania with a consistent drinking age at 21). Within each state comparisons were made between young drivers directly affected by the drinking age change and their proximal peers not the focus of the legal change (Figure 4.3). Since in Maine the drinking age was increased from 18 to 20, the crash involvement experience of 18-19-year-olds was compared to that of 20-21-year-olds, the two-year age cohort most similar to the focal 18-19 group, and yet were legally enfranchised drinkers throughout the study period. Similarly in Michigan, drivers age 18-20, the focus of the drinking age increase from 18 to 21, were compared to the three-year cohort 21-23.

In addition to the core experimental and comparison age groups, drivers age 16-17 were examined to assess any possible "trickle-down" effect of raising the drinking age. Finally, the crash involvement experience of older drivers (22-45 in Maine and 24-45 in Michigan) was

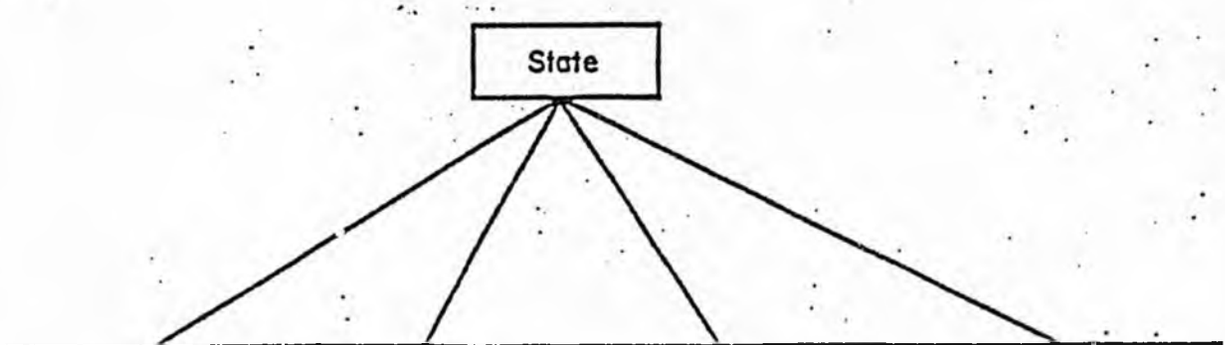
$$O_1 \quad O_2 \quad O_3 \cdots O_{n_1} \quad I \quad O_{n_1+1} \quad O_{n_1+2} \quad O_{n_1+3} \cdots O_{n_1+n_2}$$

$$O_1 \quad O_2 \quad O_3 \cdots O_{n_1} \quad I \quad O_{n_1+1} \quad O_{n_1+2} \quad O_{n_1+3} \cdots O_{n_1+n_2}$$

Figure 4.1 Non-equivalent Multiple Time-series Design

Experimental States Raising the Drinking Age		Comparison States with Unchanged Drinking Age	
Maine	Michigan	New York	Pennsylvania

Figure 4.2 First Level of Research Design Comparisons



Underage Drinkers	Focal Age Group	Comparison Age Group	Comparison Age Group
16-17 Maine	18-19 Maine	20-21 Maine	22-45 Maine
16-17 Michigan	18-20 Michigan	21-23 Michigan	24-45 Michigan
16-17 New York	18-20 New York	21-23 New York	24-45 New York
16-17 Pennsylvania	18-19 Pennsylvania	20-21 Pennsylvania	22-45 Pennsylvania

Figure 4.3 Second Level of Research Design Comparisons

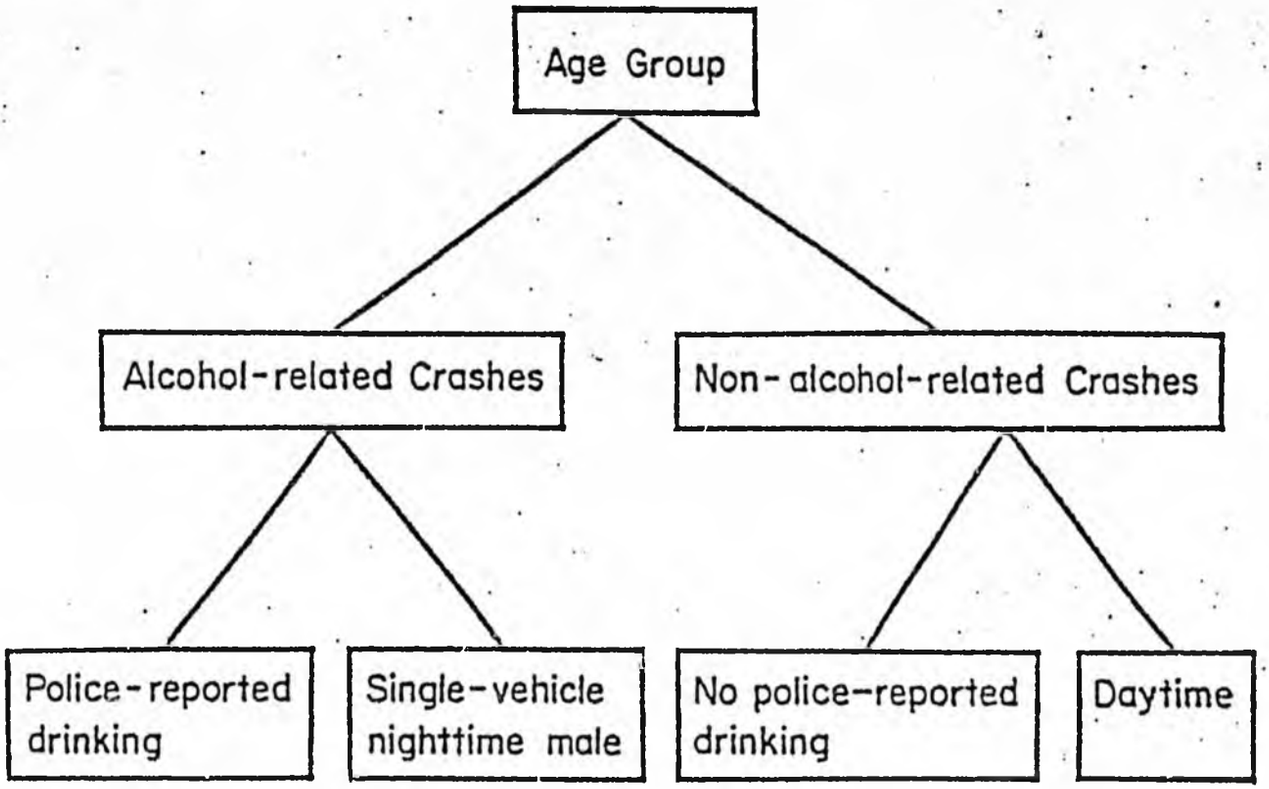


Figure 4.4 Third Level of Research Design Comparisons

analyzed to provide further comparisons with the crash experience young drivers. The four age groups were analyzed for both the st that changed the drinking age as well as those that did not.

Within each state-age group combination, alcohol-related c involvement was compared with non-alcohol-related crash involve (Figure 4.4). Since the raised drinking age was expected to affect frequency of alcohol-related crashes and have no effect on the frequ of non-alcohol-related crashes, comparison of these two classe accidents indicated whether observed changes in crash frequencies due to the drinking age changes or other coincident factors.

In short, the full tri-level hierarchical design involved following comparisons: (1) states that raised the drinking age compared with states with unchanged drinking ages; (2) within state, crash involvement experience of young drivers was compared that of older drivers; and (3) within each state and age g combination, the frequency of alcohol-related crash involvement compared to the frequency of non-alcohol-related crash involvem Each dependent variable in the full design matrix was analyzed for extended time series of observations, using the statistical mode methods described in section 4.4.

4.2 Operationalization and Data Collection

4.2.1 Definition of Variables. The core dependent time-se variables were measures of the monthly frequency of alcohol-related non-alcohol-related motor vehicle crash involvement for the states age groups included in the research design. Two indicators of alcol related crashes and non-alcohol-related crashes were analyzed. first is based on information provided by police officers investiga