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ABSTRACT

Reduced alcohol availability following the closure of the sole hotels in two rural towns afforded a naturalistic experiment to study the effects of alcohol availability and context for drinking on consumption. Measures of consumption derived from interviews, total dollars of liquor sales, and police drink-driving data were compared across two experimental and two "control" towns and two other towns in the region. Results showed a marked reduction in liquor sales, a significant reduction in reported consumption on the last and all drinking occasions, reduced spending on alcohol, and less drunkenness, with no difference in the frequency of drinking occasions for experimental and control town residents. A reduction in the number of outlets therefore led to a reduction in consumption, through a change in patterns of consumption mediated by the context for drinking. (Contains 47 references. Two figures and five tables present data and statistical analysis.) (Author)

A Naturalistic Experiment on Alcohol Availability Patterns of Consumption and the Context for Drinking

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A naturalistic experiment on alcohol availability: Patterns of consumption and the context for drinking

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Running Head: Context and alcohol consumption

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Abstract

Reduced alcohol availability following the closure of the sole hotels in two rural towns afforded a naturalistic experiment to study the effects of alcohol availability and context for drinking on consumption. Measures of consumption derived from interviews, total dollars of liquor sales, and police drink-driving data were compared across two experimental and two "control" towns and two other towns in the region. Results showed a marked reduction in liquor sales, a significant reduction in reported consumption on the last and all drinking occasions, reduced spending on alcohol, and less drunkenness, with no difference in the frequency of drinking occasions for experimental and control town residents. A reduction in the number of outlets therefore led to a reduction in consumption, through a change in patterns of consumption mediated by the context for drinking.

A naturalistic experiment on alcohol availability:

Patterns of consumption and the context for drinking

It is believed that alcohol availability and the context for drinking are important determinants of alcohol consumption, and hence alcchol-related problems. There have been few opportunities however to conduct "natural experiments" that allow a more direct assessment of these factors' influence on drinking behavior. The forced closure of the sole hotels in two small New Zealand towns presented an opportunity to conduct this type of study.

Alcohol Availability

Alcohol availability has been measured in terms of price, number of outlets, hours of sale, and the minimum purchase age. It has been argued that these variables are important determinants of consumption of alcoholic beverages, and on alcohol-related problems such as liver cirrhosis and motor vehicle crashes (e.g., Moskowitz, 1989). For example, studies investigating the effects of raising the minimum purchase age have shown reductions in alcohol consumption and motor vehicle crashes by young drivers (c.f. O'Malley & Wagenaar, 1991, see reviews by Holder, 1988; Room, 1984; Smith, 1983; Wechler, 1980). Results of this type have led some researchers to conclude that prevention strategies should aim to decrease alcohol availability (Moskowitz, 1989; Ravn, 1987).

When alcohol availability is measured in terms of the number of outlets, its relation to levels of alcohol consumption is somewhat ambiguous (Ashley & Rankin, 1988, Farrell, 1985; Single, 1988; Smith, 1983). Most studies from Canada, the United States, and the United Kingdom have reported a positive relationship between the number of outlets and the consumption of wine, beer, and spirits. For example, studies in America have found that wine sales increased between 120% and 305% in the first year following introduction of grocery store wine sales in four states (Hammond 1975), that alcohol consumption was related to numbers of off-license (Douglas, Wagenaar, & Barkey, 1980) and on-license (Colon & Cutter, 1983) outlets, and that states without controls on the number of outlets per unit of population showed increased alcoholism rates (Parker, Wolz, & Harford, 1978). In England,

McGuinness (1980) used a multiple regression analysis to show that the number of licensed premises influenced consumption. Per capita consumption of spirits (e.g., sales of gin, whiskey, vodka) has also been associated with an increase in the number of retail liquor outlets per 1000 population (Loeb, 1978).

On the other hand, some studies report no consistent increase in liquor sales with an increase in alcohol availability. In Iowa, wine sales did not increase following increased off-license wine outlets (Mulford & Fitzgerald, 1988a; but see Wagenaar & Holder, 1991), and Barnes and Bourgeouis (1977) found no relationship between per capita consumption of spirits and the number of retail liquor outlets per 1000 population across 10 Canadian provinces for the period between 1951 to 1974. Similarly, another study of per capita consumption of beer across 10 Canadian provinces found no relation between consumption and variables such as minimum purchase age, restricted off-licenses, on-license sales, trading hours, and the density of outlets (Smart & Finley, 1976).

Corresponding New Zealand research concerning alcohol availability has also produced mixed results. When the closing time for bars in hotels was extended from 6:00 pm to 10:00 pm, this increase in alcohol availability produced no change in the rates of motor vehicle crashes (Toomath & Nguyen, 1974). However, a six week cessation of beer supplies due to industrial action was correlated with a reduction in motor vehicle crashes, crime, and hospital admissions (Toomath & Nguyen, 1974).

Unfortunately, straightforward interpretation of many previous studies of alcohol availability are plagued by methodological considerations. Different countries or American states entail different ownership systems and regimes, which creates a problem for providing adequate controls (Single, 1988). Another problem is that changes in availability might be confounded with changes in the context for drinking (Holder, 1988). Finally, the reliance on correlational design and haphazard combinations of dependent measures produces its own set of difficulties. In this regard, one reviewer referred to "a Babel of indicator combinations" (Ravn, 1987, p.974). To overcome some of these problems, some authors have called for the return to "natural experiments" (Room, 1984), control group comparisons (Mulford &

Fitzgerald, 1988), and the use of smaller areas, such as a county, as an appropriate unit of analysis (Holder, 1988). For example, Douglas, et.al. (1980) state,

> A major difficulty in analysis of alcohol availability has been the absence of "natural experiments" to monitor the consequences of changes in alcohol availability. The lack of manipulated changes have forced the analysis into regression and correlational designs (p..404).

Context of drinking

A substantial number of studies show that the amount of alcohol consumed also depends on the context in which the drinking takes place. In other words, the pattern of drinking is influenced by such factors as physical location (e.g., bar, home, party), characteristics of the location (e.g., decor, loudness of music), or whether the drinker is alone or in a group. Single (1988) noted that most studies of context and alcohol consumption have focused on the last of these factors (i.e., the behavior and drinking patterns of groups or lone drinkers), and his review of Canadian and United States studies concluded that characteristics of the drinking group can dictate the rate of drinking. Drinkers in groups consume more and stay longer in bars, and light drinkers among them are encouraged to drink faster. Lone drinkers drink faster, but stay shorter durations.

Single (1988) also noted that drinking behavior and rate of drinking is influenced by certain characteristics of the physical environment; for example, whether slow music is played, whether cubicles within a large drinking area are offered, or whether background noise is loud or of long duration. A New Zealand study provides an example of this type of effect. Bradbury and Clark-Reynolds (1985) found that hotel contexts influenced the type of clientele, the length of time a patron stayed to drink, the number of persons drinking alone or in groups, the price of drinks, and the number of patrons who drank daily at a hotel. They studied three bars with differing decor and environment. Bar A was a public bar in an old city hotel. It lacked cleanliness, and carpets were worn. The condition of

Bar B, a tavern public bar, was intermediate; that is, old but not dilapidated. Bar C was an inner-city tavern attached to a modern shopping complex. Some Bar A patrons had been daily drinkers there for 25 years or more. Most patrons never stayed less than an hour and 33% stayed all day Saturday. Bar C (modern interior) had few regular drinkers, few drinkers stayed more than one hour, and patrons were prepared to pay higher prices for the more pleasant surroundings. Bar B patrons stayed longer in the evening than Bar A and C patrons. Beer was the most popular drink in Bars A and B, with mixed drinks served more often in Bar C. Thus the different contexts affected the type of clientele, their drinking behavior, the price of drinks, and length of stay.

Previous research also suggests that bars, taverns, and cocktail lounges are contexts particularly associated with heavy drinking. Clark (1985, 1988) reported on two national interview surveys of contexts for drinking in 48 American states during 1979 and 1984. In the 1979 survey, bars, taverns, and cocktail lounges accounted for 28% of drinks consumed per month and provided a context for heavy drinking. Parties were also contexts for heavy drinking and accounted for 17% of drinks consumed per month. Clubs accounted for 5%, miscellaneous contexts (e.g., restaurants) accounted for 17%, and homes accounted for 33% of drinks per month. The replication survey in 1984 produced a similar pattern of results (Clark, 1988). Furthermore, while male and female tavern regulars frequently consumed more than all other drinkers, Clark (1988) also found that both tavern regulars and light drinkers consumed more when drinking at bars and parties than in miscellaneous contexts for drinking. Similarly, other survey studies from Scotland, Canada, France, and America indicate that the amount patrons consume was related to the frequency of visiting taverns; that is, frequent patronage of taverns and bars in these countries indicated higher consumption (Clark, 1981b). Recent studies focusing on the drinking behavior of professional women (Shore & Bath, 1991) and student problem drinkers (Engwall & Goldstein, 1990) also linked level of consumption and context for drinking.

Overall, these studies support Single's (1988) conclusion that different

contexts encourage different patterns of drinking, and that these can lead to different levels of consumption. Furthermore, they show how the effects of alcohol availability on consumption might be mediated by effects of the drinking context. Whenever alcohol availability changes because the number of outlets change, it is likely that there will be a concomitant change in the context for drinking, owing to a redistribution of drinkers across the remaining types of outlet. A change in overall consumption might occur owing to these changes in context rather than reduced availability of alcohol per se.

This paper is one of three (Kraushaar, 1992) longitudinal studies (encompassing data from 1982 to 1993) which reports the results of crime before and after hotel closures 1982-1989 (Kraushaar & Alsop, 1995b), and crime data after hotels reopened between 1990-1993 (Kraushaar & Alsop, 1995c - in preparation). A third paper will describe the alternative activities that were engaged in during hotel closures such as increased leisure activities by previous hotel patrons (Kraushaar, 1992; Kraushaar & Alsop, 1995). Lastly, these studies will be explained in terms of the behavior theory and choice and how the availability of choices between drinking or alternatives to alcohol consumption can be effective measures for primary prevention (Kraushaar, 1992; Kraushaar & Alsop, 1996).

This first paper examines drinking behavior in a small region of New Zealand following the destruction of the sole hotels in two towns. This caused a sudden reduction in alcohol availability in these towns with changes to on-license bar facilities and closure of the sole off-license (take home) retail outlets. The study used liquor sales data, interviews, and police records to compare consumption in these towns with that in nearby towns where availability remained unchanged. The interviews also investigated the context for drinking because the change in availability might have generated a change in the context (e.g., from bars to homes), that might modulate the effects of availability (Holder, 1988; Single, 1988).

METHOD

General Design

The sole hotels in two rural towns were suddenly closed. The effect of this reduction in alcohol availability on residents of these experimental towns was assessed in three ways:

1. Liquor sales for the six years prior and two years post hotel closure were compared to liquor sales in two nearby control towns, and to those in two larger towns in the region. These data included sales in all on-license outlets (clubs and hotels permitted to sell bar sales liquor) and all off-license outlets (permitted to sell unopened, packaged, or bottled liquor).
2. Small samples of residents were interviewed in the two experimental towns with the two control towns. These interviews focused on patterns of consumption and the context for drinking.
3. Police records of drink-driving offenses in the experimental towns, the control towns, and the region's larger towns were compared before and after the hotel closures.

Populations

All six towns were within the same geographic area of New Zealand. The major town (Town E) had a population of 22,944 (all population data from the 1986 census), and it had full facilities including a hospital that delivered service to a regional population of 35,000. The five smaller towns were within 40 kilometers of this major town. While the towns were sufficiently distant to be regarded as independent units, they were comparable in terms of general socioeconomic factors.

Experimental Towns

Town A (population 891) was 12 kilometers (all distances by road) south of Town E. Its sole hotel was destroyed by fire in December 1987. As a result, the nearest off-license premises were Town C (25 kilometers) and Town E. The remaining on-license premises were a rugby football club, a squash club, and a lawn bowling club. Such sports clubs are entitled to sell liquor only when sports events or

training are in progress. A new hotel was opened in June 1989.

Town B (population 1,929) was 30 kilometers west of Town E. Its sole hotel was demolished after a devastating earthquake in March 1987 (Muller, 1987). The nearest off-license premises were Town C (8 kilometers) and Town E. The remaining on-license premises were three sports clubs (rugby football, squash, and lawn bowling) and a chartered social club. Licensed chartered clubs are permitted to sell liquor for the same on-license hours as a hotel; that is, 10:00 am to 10:00 pm. A new hotel opened in December 1989.

Control Towns

Town C (population 594) was 20 kilometers west-south-west of Town E. It had one hotel with on-license and off-license facilities, and two on-license sports clubs (rugby football and golf). Town D (population 528) was 25 kilometers west-north-west of Town E. It had one hotel with on-license and off-license facilities, and one licensed sports club (rugby football). The number of outlets in these towns was unchanged from 1984 to 1989.

Other Towns

Town E, the largest in the region, had four hotels with both on-license and off-license facilities, two licensed tourist motels, three chartered clubs, and six licensed sports clubs. A new license was issued to a tourist motel in 1988/1989. Town F (population 8,595) was 40 kilometers west-south-west of Town E. It had one hotel with on-license facilities, a wholesale off-license outlet, two licensed chartered clubs, and four licensed sports clubs. Two chartered clubs were issued licenses in 1988/1989.

Data Collection

Liquor Sales

Annual liquor sales from 1982 to 1989 for the licensed premises in the six towns were obtained from the Licensing Control Commission (LCC); a New Zealand Government tribunal of the Justice Department. The LCC hears liquor license applications before a high court judge, and renews and controls existing licenses

by statutory authority. All licensed establishments including sports clubs, chartered clubs, social clubs, hotels, and motels are required to report annual liquor sales and the numbers of club members to the LCC. Failure to do so within a proscribed period could result in either prosecution and fine, or possible withdrawal of the liquor license. These reports were usually completed for licensed premises after an accountant's audit.

Drink-driving offenses

Police National Headquarters supplied summarized and detailed quarterly drink-driving offenses by residents in the towns under study (their records combined offenses for Towns D and E). Drink-driving offenses included driving with excess breath/blood alcohol (above 80 mg of absolute alcohol), and causing an accident or injury with excess breath/blood alcohol. Each police officer codes and files a weekly incident report from daily incident records. Police computer personnel at district headquarters (Town E) entered and verified traffic offence data. All district headquarters have a computer link to the Department of Justice National Computer center. Monitoring of traffic offenses and internal audits occur at every policing level including each police station, district headquarters, and regional headquarters.

Interviews of Residents

Residents of Towns A, B, C and D were interviewed in May 1989. Twenty residents from each town were randomly selected from the 1986 electoral roll; each resident had an equal chance of selection. Residents were telephoned and asked if an appointment could be made at their home for an interview concerning the effects of the hotel closing. If a resident declined by telephone or after an appointment, the next person on the electoral roll was contacted. Residents gave written informed consent to the interviewer; these interview procedures were approved by the University of Otago Ethics Committee.

A structured interview was constructed from interview and questionnaire forms used in other alcohol studies in New Zealand (see references Ph.D.?). The

interviews determined patterns of alcohol consumption including the last drinking occasion, previous drinking occasions over the last month, the type of drink(s) consumed, the physical context and days of drinking, off-license liquor purchases, and demographic information. Questions concerning previous drinking occasions were accompanied by detailed photographs of glass sizes containing a wide range of beer, low calorie beer, homebrew, wines, spirits, fortified wines, and liquors for identification. Each drink was converted into an absolute alcohol measure, milligrams of absolute alcohol by volume, from a drink-intensity index of all beverages, as used in the 1985 Milton survey (Paulin, Simpson, & Wall-Manning, 1985).

RESULTS

Overall levels of consumption

The data from liquor sales, drink-driving offenses, and the interviews indicated that alcohol consumption was reduced in Towns A and B during the period of hotel closures. Table 1 shows total sales in the six individual towns for two year periods from 1982/83 to 1988/89. Liquor sales typically showed a steady increase from 1982/83 to 1986/87. After the hotel closures (1988/89), however, total sales decreased in experimental towns by 92% in Town A and by 72% in Town B. Obviously, spending on alcohol did not simply transfer to the on-license clubs in these towns. The control towns, C and D, continued to show their steady increase in sales over the same period, and the sales patterns from Towns E and F provided verification that these increases for the control towns were consistent with consumption in larger and more distant locations within the region.

------Insert Table 1 about here-----

The drink driving data were also consistent with a reduction in consumption by Town A and B residents. Drink-driving offenses were converted into offenses per 1,000 in order to equate differing population sizes across the six towns. The data for each town are shown in Table 2 for the periods 1986/87 and 1988/89. Drink-driving offenses in both experimental towns decreased during hotel closures, while

drink-driving offenses in control towns and other towns typically increased. When drink-driving offenses before and after hotel closures were combined for the police areas in each group of towns (Towns A & B and Towns C, D & E, F) the number of offenses per 1.000 in experimental towns was significantly less than in control towns; $X^2(1,N=57) = 10.92, p<.001$.

The drink driving data were of particular interest because they gave some indication of possible relocation of drinkers from experimental towns to control or other towns. Drink-drivers returning from control or other areas should be revealed in experimental towns drink driving figures. With a return journey of 8 to 30 kilometers into each experimental town police area, and only one arterial road into each town, detection by police patrols was very easy. Therefore, the reduction in drink-driving figures in experimental town police areas was consistent with little relocation of drinkers to the control towns.

-----Insert Table 2 about here-----

For each person interviewed, two dependent measures were derived from responses to questions about drinking, each translated into milligrams of absolute alcohol equivalent; that is, 1) absolute alcohol on the last drinking occasion, and 2) absolute alcohol on each drinking occasion for all previous drinking occasions recalled for the previous month. Figure 1 (top panel) shows that residents in the experimental towns consumed less alcohol on the last drinking occasion than control town residents. The mean alcohol consumption for the combined data from the experimental towns (M = 40.32 mg) was significantly less than that of the control towns (M = 96.15 mg; $t(78) = 3.20$, $p<.01$. Similarly, Figure 1 (bottom panel) shows that the mean absolute alcohol consumed on each drinking occasion in the last month (a total of 134 occasions across the four towns) was less for residents in experimental towns than control towns. When measures were combined for experimental and for control town residents, mean absolute alcohol consumption on each drinking occasion was significantly less for experimental towns (M = 37.87 mg) than for control towns (M = 92.20 mg; $t(78) = 2.94$, $p<.01$. When spending each week

was combined for experimental and for control towns, reported mean spending each week on alcoholic beverages was significantly less for experimental towns ($\underline{M}$ = \$13.42) than for control town residents ($\underline{M}$ = \$27.92; $\underline{t}(78) = 2.501$, $p<.05$).

-----Insert Figure 1 about here-----

It is notable that the mean absolute alcohol consumed on each drinking occasion by control town residents was above the legal drink-driving limit of 80 milligrams of absolute alcohol. Table 3 (upper panel) shows that for residents of control towns there were about as many occasions when more than 80 milligrams of absolute alcohol was consumed as there were when less than 80 milligrams was consumed for the last drinking occasion. For residents of experimental towns however, there were many more occasions when the alcohol consumed was less than 80 milligrams than when it was more than 80 milligrams; $X^2(1,N=71) = 17.09$, $p<.001$ (individuals for whom there were no drinking occasions in the last month did not contribute to the analysis). Another interview item, where residents were asked to estimate the frequency with which they "got drunk", provide additional support for this finding (Table 3 - lower panel). Residents in the experimental towns reported "getting drunk" less frequently than residents in control towns, $X^2(3,N=80) = 18.80$, $p<.05$). These results in Table 3 are consistent with the differences in drink-driving offenses found between the towns (Table 2).

-----Insert Table 3 about here-----

Frequency, amount consumed and context of drinking occasions

The difference in level of consumption between experimental and control town residents could arise from differences in the frequency of drinking occasions, differences in the amount consumed on each occasion, or a combination of these factors. The interview data suggested that amount consumed on each drinking occasion was the important factor contributing to this difference, and that this change was largely related to a shift in the context for drinking.

Table 4 shows the frequency of reported drinking occasions in the past month in each experimental and control town. A drinking occasion was defined as an episode when one or more alcoholic drinks were consumed. There were no major

differences in the pattern of drinking occasions between the individual towns. In both control and experimental towns, relatively few residents reported more than one drinking occasion for the last month.

---Insert Table 4 about here---

The interview data also suggested that the reduction in consumption on each drinking occasion was related to the context of drinking. Residents were asked about where they usually drank and where they usually purchased their take-home liquor supplies before and after the hotel closures. These data are shown in Table 5. The hotel closures produced considerable changes in the usual locations for drinking by experimental town residents (Table 5, upper panel). Prior to the hotel closures, the usual drinking location for most Town A and B residents (25 of 40 residents) was their local hotel. The local hotel was also the usual drinking location for a similar number of Town C and D residents (27 of 40 residents). Following the hotel closures, the usual drinking location for Town A and B residents was at home (26 of 40), accompanied by a small increase in the number usually drinking at clubs (from 2 to 11). Over the same period, the pattern of drinking locations for Town C and D residents remained relatively unchanged (Table 5).

---Insert Table 5 about here-----

On the other hand, the hotel closures had little effect on the location of purchasing take home liquor supplies. Before the hotel closures, few residents in either Town A or B regularly purchased off-license supplies from their local hotels (lower panel, Table 5), where liquor was sold at retail prices, preferring to buy it from cheaper wholesale outlets in Town E. This was a reasonably convenient arrangement because most residents drove to Town E each week to purchase bulk groceries. Some Town B residents also purchased their off-license liquor supplies from wholesale outlets in Town C. In both control towns (C and D), residents purchased wholesale off-license liquor at their hotel outlet, or the wholesale outlet in Town E. These patterns remained relatively unchanged by the hotel closures.

To what extent did change in the context of drinking by experimental town residents contribute to the reduction in their consumption? The interview data allowed calculation of the mean amount of alcohol consumed by residents of experimental and control towns in five different types of location; that is, hotels, clubs, other homes, home, and miscellaneous contexts (e.g., restaurants, workplace, marae - meeting ground of the Maori community). Figure 2 presents these data calculated for the last drinking occasion (upper panel) and for all drinking occasions over the past month (lower panel). For the last drinking occasion, the total number of residents drinking in the above locations were 14, 13, 10, 28, and 6 respectively (a further 9 residents reported no drinking in the last month). Only two residents reported multiple drinking contexts during a drinking occasion. For the 134 drinking occasions over the past month, there were 26, 18, 16, 68, and 6 occasions for hotels, clubs, other homes, home, and miscellaneous contexts respectively.

-----Insert Figure 2 about here-----

There are two important features of the results shown in Figure 2. First, home was a context associated with relatively moderate alcohol consumption for both experimental and control town residents. This was the case for both the last drinking occasion and drinking occasions over the past month. Given that a greater number of experimental town residents usually drank at home compared to control town residents (Table 5); this seems a major contributor to their lower overall consumption. The second feature was the difference between the amount consumed by experimental and control town residents in hotels and clubs. On the last drinking occasion (upper panel), experimental town residents had significantly lower absolute alcohol consumption in hotels ($\underline{M}$=38 mgs) than control town residents ($\underline{M}$ = 162 mg; $\underline{t}(12) = 3.95$, $p<.002$). Similarly, mean absolute alcohol consumption in clubs on the last drinking occasion by experimental town residents ($\underline{M}$ = 19 mg) was significantly lower than consumption in clubs by control town residents ($\underline{M}$ = 182 mg; $\underline{t}(11) = 4.90$, $p<.001$. Drinking occasions over the last month also showed this difference (lower panel). The mean absolute alcohol consumption in hotels by

experimental town residents (M = 36 mgs) was significantly lower than consumption by control town residents (M = 135 mgs; $t(24) = 3.75$, $p<.001$), and mean absolute alcohol consumption in clubs by experimental town residents (M = 19 mgs) was also significantly lower than consumption by control town residents (M = 138 mgs; $t(16) = 4.50$, $p<.001$). It is also worth noting that in the past month, control town residents exceeded the legal drink-driving limit of 80 milligrams of absolute alcohol on over 50% of drinking occasions in hotels (17 of 20), clubs (6 of 11), and in other homes (6 of 9), but not at home (5 of 27) or miscellaneous contexts (0 of 1). Experimental town residents generally exceeded 80 milligrams of absolute alcohol on far fewer occasions; 1 of 6 in hotels, 0 of 7 in clubs, 2 of 7 in other homes, 1 of 41 at home, and 1 of 5 in miscellaneous contexts.

DISCUSSION

The level of alcohol consumption by residents of two towns whose sole hotels were closed was significantly lower than that in nearby control towns. Evidence from liquor sales (Table 1), drink driving offenses (Table 2), and interview data (Figure 1) converged to support this conclusion. This difference in consumption arose not from a difference in the frequency of drinking occasions (Table 3), but from a difference in the amount consumed on each drinking occasion (Figures 1 & 2, Table 4). Furthermore, a change in the context for drinking appears to have been a major factor contributing to the reduction in amount consumed on each drinking occasion (Table 5, Figure 2).

The fortuitous set of circumstances enables this naturalistic experimental departure from non-correlational studies with its plethora of indicators (Ravn, 1987). However, this study also presented problems for the research. Two issues in particular need to be addressed. First, it could be argued that the size of the single point survey in the present study (N=40 in each experimental and control group) was insufficient to draw strong conclusions. The sample size was constrained because the new hotel in Town B was due to open quite soon (one month later), and this would change the characteristics of alcohol availability in the

region. Nevertheless, we believe there are several reasons for having some confidence in the interview data. The results from the interviews were consistent with the data from other sources (i.e., liquor sales and police records). Furthermore, there were important similarities between the interview data from the control and experimental towns; that is, the frequency of drinking occasions (Table 4), the usual drinking locations before hotel closures (Table 5), and the amount consumed in particular contexts (e.g., at home, Figure 2) were similar across the two groups. The major exception to this pattern was the amount consumed in hotels (Figure 2), where experimental town residents consumed less than control town residents. This difference might arise because the experimental town residents had to drive a greater distance in order to get home from a hotel, and this extra traveling would expose the drink driver to an increased risk of detection by police. Overall, the evidence supports the conclusion that the interviews reflected a difference in drinking behavior between experimental and control town residents rather than merely an accident of random sampling.

The second issue concerns the status of the experimental and control towns as independent units; that is, there might have been a major relocation of drinkers from experimental towns to control towns. The interviews (Table 3 - Drinking occasions above legal limits, drunkenness, and spending on alcohol), and the drink driving data indicated that this did not happen (Table 2). Furthermore, if substantial relocation had occurred, then liquor sales in nearby towns should show a disproportionate increase. Again, this did not appear to be the case. To further check this hypothesis, we compared the liquor sales between control towns (C & D) and two other towns (E & F) over a 40 kilometer radius for this region (population about 30,000). Over the period 1988 to 1989, when the hotels in Towns A and B were closed, the rates of increase in liquor sales in towns C, D, and E were very similar in these distant towns. Town F showed the only marked increase in liquor sales over this period (Table 1), but it seemed most unlikely that the difference was due to relocation of drinkers from town B (the closest experimental town). This would have entailed travelling (40 kilometers to Town F) through Town

C which had its own hotel and wholesale off-license facility. Instead, the increase in sales in Town F seemed related to the opening of two new chartered clubs; that is, there was an increase in alcohol availability for residents of that town.

The present naturalistic experiment supports the conclusions of a number of previous studies. First, a reduction in alcohol availability showed a corresponding reduction in reported consumption. Studies of interruption of supply (e.g., by industrial action) have found similar results in Finland (Makela, 1980), Norway (Horverak, 1983), Canada (Smart, 1977), and New Zealand (Brown, 1978). However, the interruptions of supply in these earlier studies were relatively short (weeks) in duration and widespread in nature, and this offered few opportunities for consumers to arrange other sources of alcohol. The present study, spanning almost two years, showed (using sales data) that quite a specific reduction in alcohol availability was influential in reducing consumption over two years duration. Indeed, corresponding alcohol availability research using correlational and regression analysis has produced more mixed results (Ashley & Rankin, 1988; Farrell, 1985; MacDonald & Whitehead, 1983; Smith, 1983; Single, 1988), and there are notable differences between the present study and some of this previous research. For example, many previous studies examined the effect of increases in alcohol availability in situations where alcohol was already reasonably available. In contrast, the present study examined a decrease in alcohol availability, and that decrease involved the loss of the traditional source of alcohol in that community (Tables 1 & 5). Furthermore, the present study allowed ready comparison between the experimental towns and suitable control communities because the reduction in availability was so localized. Second, previous studies of the number of outlets and its relation to levels of increased alcohol consumption have been somewhat ambiguous (Ashley & Rankin, 1988; Far ell, 1985; Single, 1988; Smith, 1983). In this study total liquor sales, drink driving, and interview data all converge to show a decrease in alcohol availability impacted <u>both</u> experimental town residents, but not control town residents.

Third, and perhaps more importantly, the present study adds to the growing number of studies linking alcohol availability and context for drinking as determinants of consumption. There were no differences between the frequency of drinking occasions between the experimental and control town residents, rather the experimental town residents drank at home more often than the control town residents, and this context was associated with a moderate level of consumption for both groups (Figure 2). The high frequency of drinking in hotels by residents of experimental towns before hotel closures, and by residents of control towns before and after closures (Table 5), was somewhat surprising given that national surveys of drinking occasions in New Zealand (Martin, 1984; Stewart, & Casswell, 1986) and other countries (Clark, 1981a; 1985; Dight, 1976) indicate that the most frequent context for drinking is at home, with less frequent drinking occasions in hotels, clubs, and other homes. Perhaps this difference reflects an increased social function of hotels in rural communities. However, the present study was consistent with the results of these previous surveys in that the frequency of drinking in unlicensed premises (e.g., at home) did not necessarily indicate high levels of consumption in these contexts (Table 5, Figure 2). Just as some contexts for drinking appeared to mediate lower level of consumption, the results indicated that some contexts (i.e., hotels) mediated higher levels of consumption by control town residents. This finding is consistent with previous studies that found licensed premises were high-risk venues for increased alcohol consumption. For example, Clark's (1985, 1988) national surveys in the United States showed that taverns, bars, and cocktail lounges mediated higher levels of consumption by both heavy and light drinkers than other contexts. In addition, recent studies of the influence of drinking context for teenagers in New Zealand (Connolly, Casswell, Stewart, & Silva, 1992), teenagers in England (Plant, Bagnall, & Foster, 1990; Thombs & Beck, 1994) and for women in American (Shore & Bath, 1991) confirm these findings that situational factors and contexts of drinking are strong determinants of increased consumption: and DWI as this study showed (Table 2 & 4).

The results of the present study also support research linking context of

drinking, levels of consumption, and incidence of drink driving; that is, patrons in hotels, clubs, or licensed premises often exceeded the legal drink-driving limit. In the present study, detected instances of drink driving were lower in the experimental towns than the control towns, and experimental town residents reported significantly fewer occasions of exceeding the legal drink-driving limit of 80 milligrams of absolute alcohol. These results are consistent with a national New Zealand survey where one in three drinking occasions that exceeded 80 milligrams of absolute alcohol occurred in licensed hotels/taverns and clubs (Stewart, & Casswell, 1986). Similarly, O'Donnell (1985) reviewed 13 studies regarding the relationship between the context for drinking and drink-driving offenses, and she concluded that this figure may be as high as 50% of offenders had been drinking at licensed premises.

Recent reviews have emphasized the importance of further research concerning the context for drinking as a factor in alcohol-related problems and as an important feature of prevention strategies (Holder, 1988; Moskowitz, 1989; Room, 1984; Single, 1988). For example, Single (1988) concluded that future research should focus on the context for drinking, the behavior of servers, and that the alcohol industry should accept greater social responsibility for alcohol-related costs of alcohol consumption. In addition, Room (1984) and Moskowitz (1989) noted that the effects of context appear to be important for the formulation of adequate primary prevention policies and interventions. Similarly, O'Donnell (1985) suggested that there was significant potential for primary prevention strategies at licensed premises to reduce drink driving. The present long-term study supports such views and adds to the body of literature on interruption of liquor supplies studies. Plus the results indicate that alcohol availability and context for drinking may be important codependent factors when considering alcohol-related problems. Indeed, this study shows the resulting decrease in alcohol availability mediated by the context for drinking has relevance both at the individual level for drink drivers, and relevance for rural communities.

This study also answers the call for more naturalistic experiments (Room,

1984), with control group comparison (Mulford & Fitzgerald, 1988), using smaller areas as appropriate units of analysis (Holder, 1988), so as to force analysis of changes in alcohol availability away from regression or correlational designs (Douglas, et.al., 1980). In addition, this study extends the benefits that can be gained from longitudinal naturalistic experimental and control group designs to evaluate the effects of alcohol availability. So as to help formulate better primary prevention strategies (Moskowitz, 1989; Room, 1984) such as suggested by the behavioral theory of choice supporting inexpensive, accessible alternatives to drinking in hotels and clubs (Kraushaar, 1992) in rural communities.

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Footnote

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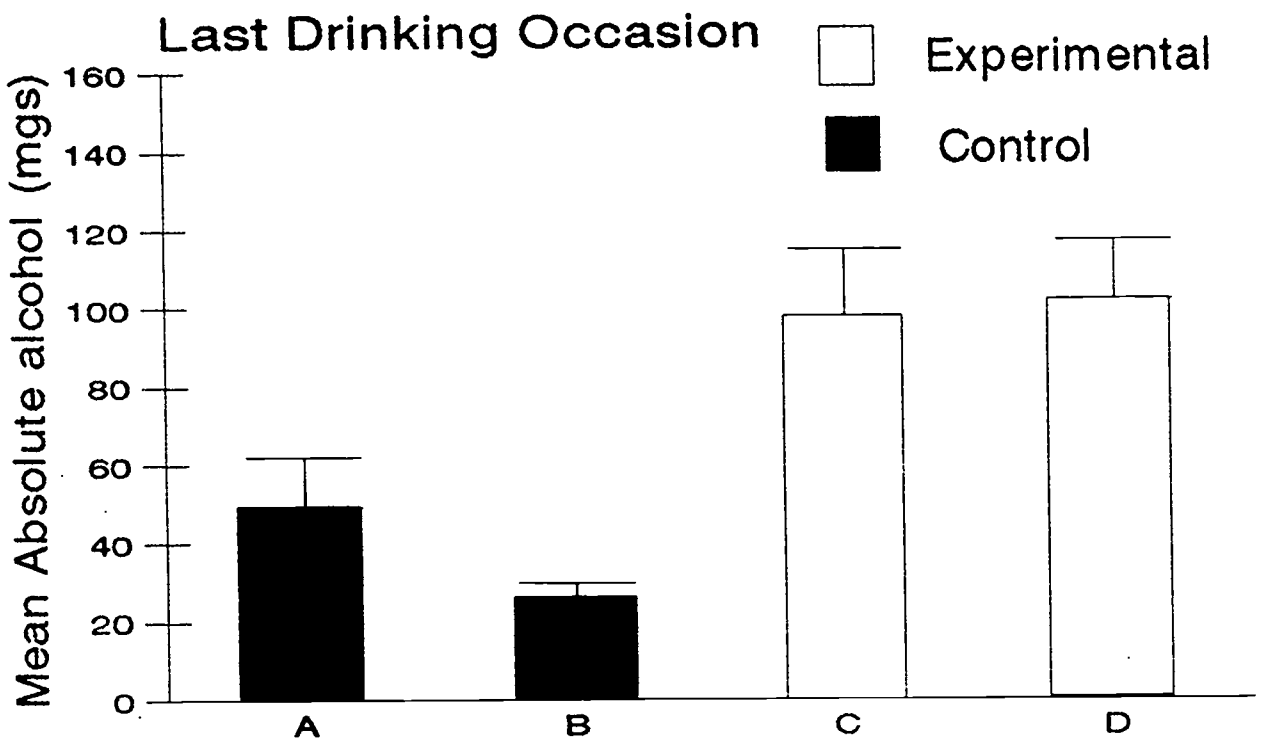
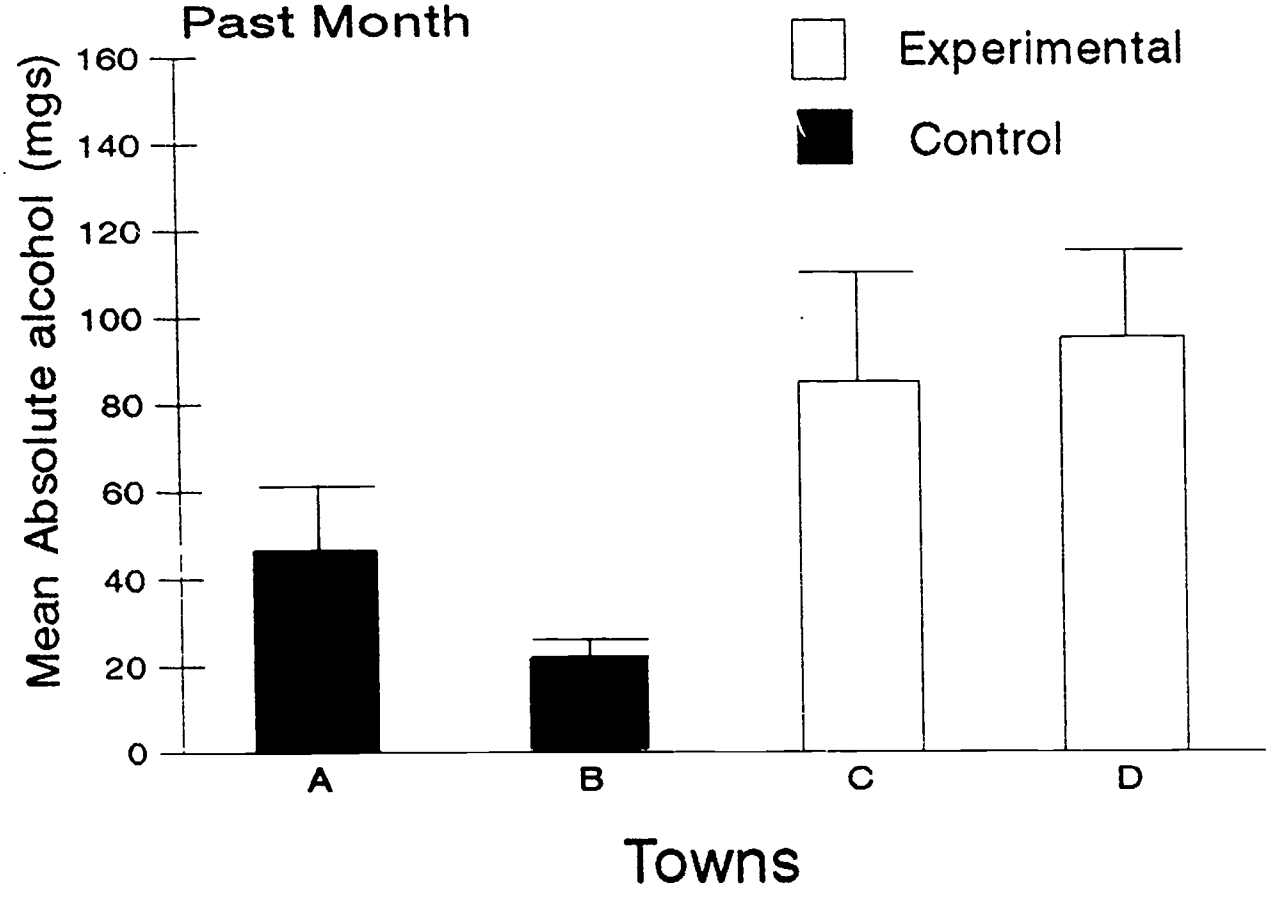
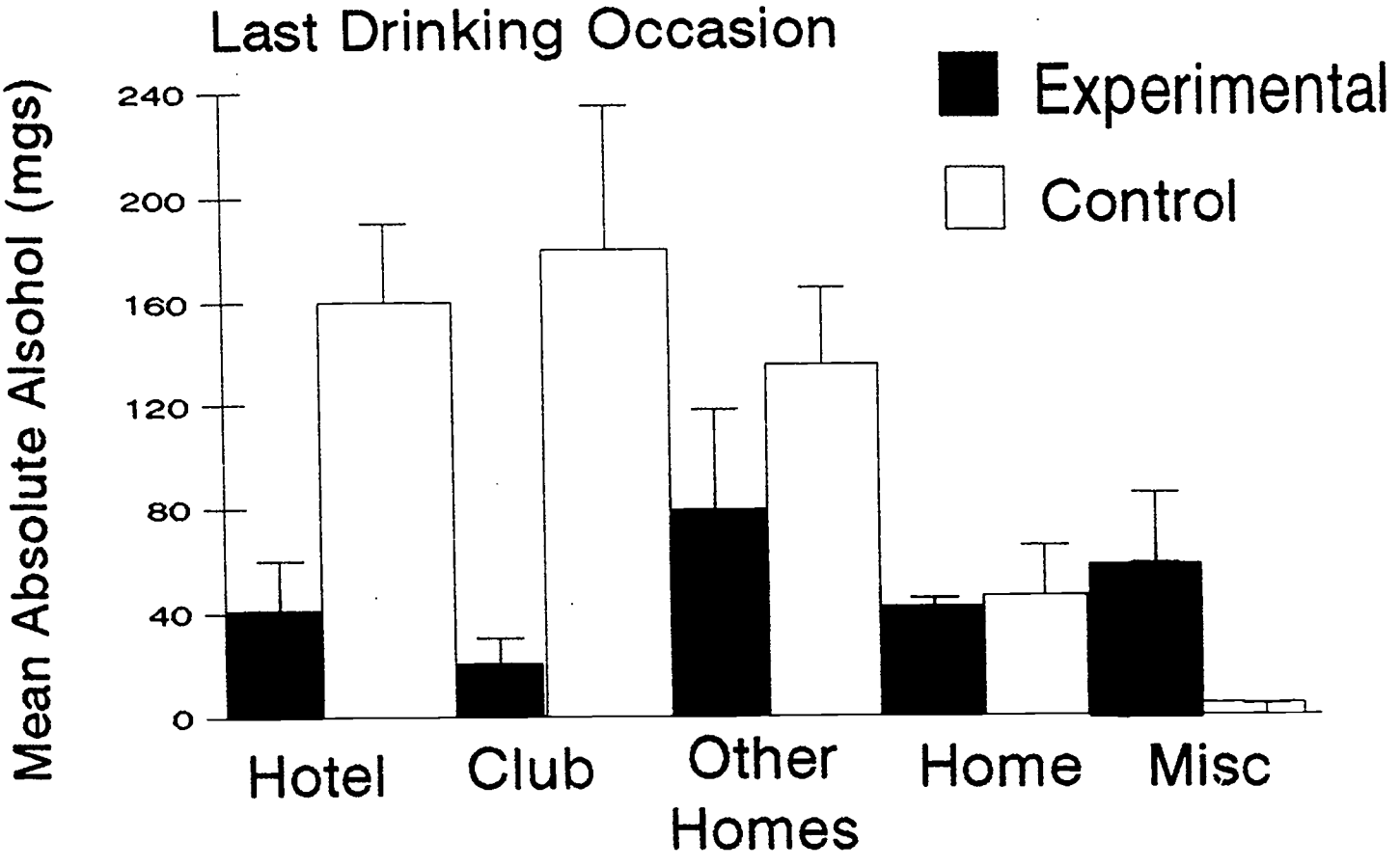
FIGURE LEGENDS

Figure 1 Mean absolute alcohol on the last drinking occasion (top panel) and mean absolute alcohol on all drinking occasions for the past month (bottom panel) by experimental town (A & B) and control town (C & D) residents.

Figure 2 Mean absolute alcohol on the last drinking occasion (top panel) and mean absolute alcohol on all drinking occasions for the last month (bottom panel) by experimental and control town residents in different contexts.


Last Drinking Occasion
Experimental
Control
Mean Absolute alcohol (mgs)
160
140
120
100
80
60
40
20
0
A
B
C
D


Past Month
Experimental
Control
Mean Absolute alcohol (mgs)
160
140
120
100
80
60
40
20
0
A
B
C
D
Towns


Last Drinking Occasion
Experimental
Control
Mean Absolute Alsohol (mgs)
240
200
160
120
80
40
0
Hotel
Club
Other Homes
Home
Misc

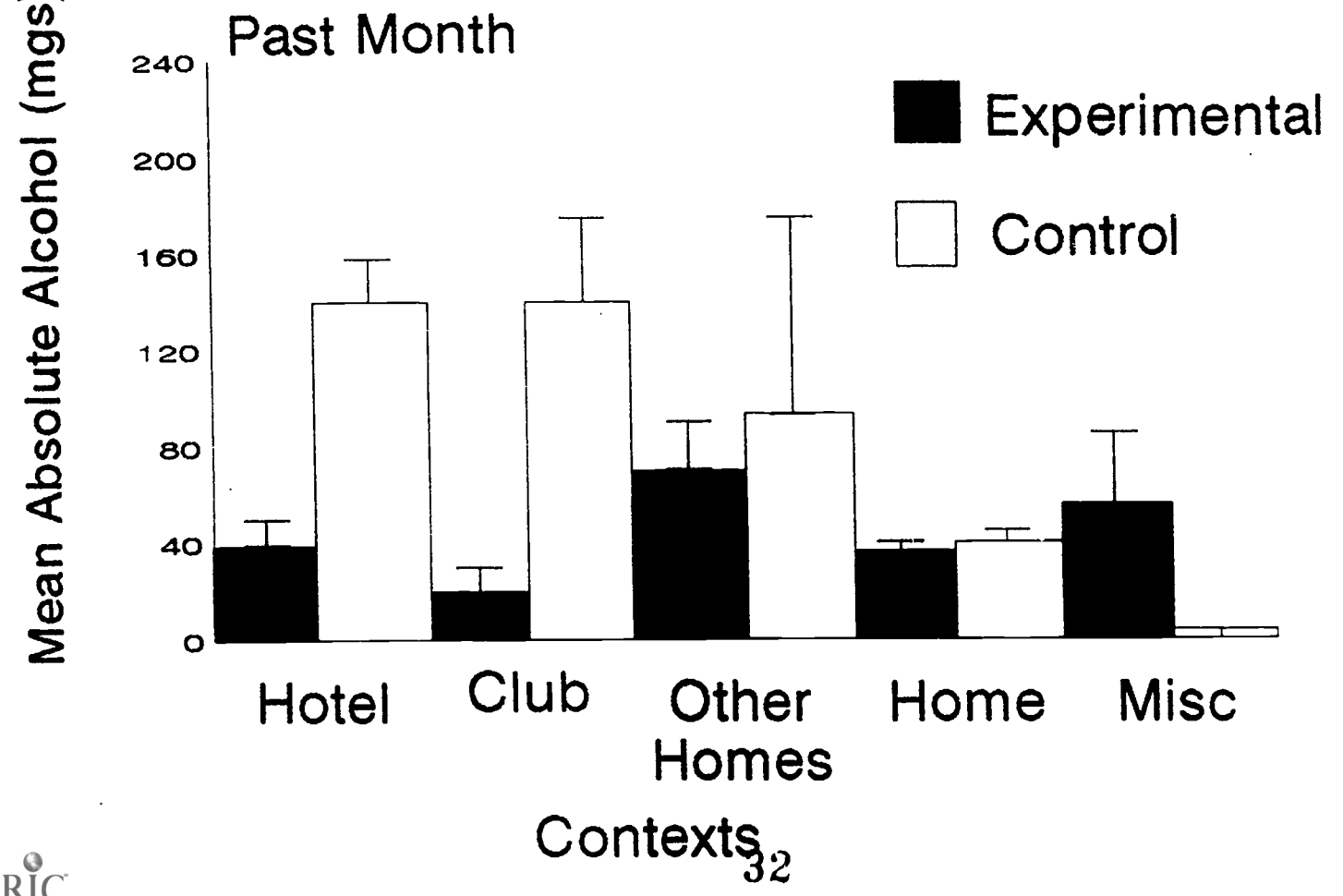

Past Month
Experimental
Control
Mean Absolute Alcohol (mgs)
240
200
160
120
80
40
0
Hotel
Club
Other Homes
Home
Misc
Contexts

Table 1. Total ($) liquor sales turnover for Experimental (A & B), Control Towns (C & D), and Towns E and F

Towns	1982/83	1984/85	1986/87	1988/89
A	821,432	1,086,623	2,196,224	172,584
B	1,891,168	2,717,768	2,990,176	841,371
C	988,532	1,252,087	1,737,002	2,086,952
D	847,757	841,537	1,420,111	1,833,183
E	7,744,174	10,124,004	12,958,535	15,080,949
F	3,679,567	3,191,555	2,703,160	4,170,282

Table 2 Drink-driving offenses per 1,000 in experimental and control towns before 1986/87 and after 1988/89 hotel closures.

Towns	Years	
	1986/87	1988/89
Experimental		
A	3	1
B	10	2
Total	13	3
Control		
C	9	15
D & E	2	5
F	2	12
Total	13	32

Table 3 Frequency of drinking occasions above and below legal limit

Towns	<80ms	>80mgs
Experimental	34	3
Control	15	16

Frequency of drunkenness for experimental and control town residents

Towns	Weekly	Monthly	Yearly	Almost/never
Experimental	1	7	18	14
Control	10	8	9	13

Table 4 Frequency of reported drinking occasions

TOWNS	DRINKING OCCASIONS			
	1	2	3	4 or more
Town A	17	2	0	1
Town B	14	3	0	3
Town C	15	3	1	1
Town D	15	2	1	2

Table 5 Location of drinking and off-license purchases of alcohol

	Town A		Town B		Town C		Town	
Location	before	after	before	after	before	after	before	after
Drinking Location								
Hotels Town A	15	-	-	-	-	-	-	-
Hotel Town B	-	-	10	-	-	-	-	-
Hotel Town C	-	-	-	-	14	14	-	-
Hotel Town D	-	-	-	-	-	-	13	13
Hotels Town E	-	-	1	-	-	-	-	-
Hotel Town F	-	-	-	-	-	-	-	-
Home	3	13	5	13	4	4	5	5
Town Clubs	-	5	2	6	1	1	1	1
Clubs Town E	1	1	-	-	-	-	1	1
Don't buy/drink	1	1	1	1	1	1	-	-
Off-license Purchases location								
Hotels Town A	4	-	-	-	-	-	-	-
Hotel Town B	-	-	3	-	-	-	-	-
Hotel Town C	-	-	6	7	14	14	-	-
Hotel Town D	-	-	-	-	-	-	13	12
Hotels Town E	15	18	10	12	2	2	6	7
Hotel Town F	-	1	-	-	-	-	-	-
Don't buy/drink	1	1	1	1	4	4	1	1