

RESEARCH REPORT

Familial transmission of alcohol use, III. Impact of imitation/non-imitation of parent alcohol use (1960) on the sensible/problem drinking of their offspring (1977)

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Abstract

Imitation/non-imitation by adult offspring of alcohol-related parent behavior was examined in the context of the 'fall-off effect' and of sensible/problem alcohol use, two processes which tend to constrain drinking. Evidence indicates there is more imitation by adult offspring of abstemious parents (both abstainer and low volume) than of high volume parents. Adult offspring drink significantly less, on the average, than their high volume parents, a phenomenon here termed 'fall-off effect' for both men and women with respect to either their fathers or mothers. This fall-off among social drinkers appears when the mother approaches or the father consumes at or more than a typical daily drinking level (≥ 1 drink per day). More sensible drinking occurs among adult offspring when (1) the parent has no drinking problem-signs than when the parent has drinking problems (this pattern appears at all levels of offspring consumption), and (2) when parents drink at high volume and have no problems for those offspring who do not imitate parent volume. Drinking 'sensibly' appears to be associated directly with the level of parent alcohol use and offspring's own drinking levels (considered as imitation or non-imitation of parents), and indirectly with offspring recall of problematic intake by parents. Drinking sensibly is a medical, education and public health issue.

Prior articles in this series have reported on alcohol consumption in a community sample of adult offspring in 1977 in relation to their parents' drinking volume in 1960 (Webster *et al.*, 1989; Harburg *et al.*, 1990; Gleiberman *et al.*, 1990). Results indicated that both imitation and non-imitation of volume occurred predictably across generational lines. The strongest prediction was called the 'fall-off' effect (Harburg *et al.*, 1990). It appeared that an aversive or fall-off effect occurred among a high proportion of offspring such that the higher the volume (ounces/week) of parent intake, the more likely that most offspring drank much less. This response was especially strong for daughters

vis-à-vis fathers. On the other hand, non-imitation of parents' volume also occurred to offspring of low volume parents who however also manifested problems with alcohol. This result was especially true for sons, where the percentage of male offspring who drank at high volume under such conditions was higher than expected. This article examines the likelihood that any one or more of these combinations of imitation and non-imitation of high/low volume parents who did/did not have problems with alcohol may also be associated with whether or not the adult offspring became *sensible or problem users* of alcohol at different levels of offspring volume.

In order to explore this issue, we examined certain combinations of parent-offspring alcohol use in relation to a Sensible/Problem Drinking Scale (SPDS) described elsewhere (Harburg *et al.*, 1989). Briefly, the SPDS scale consists of three ranked categories: sensible, border and problem drinking. These categories were developed from data on alcohol-related traits such as the negative social consequences of drinking, the degree of craving, reasons for drinking, affect when drunk and hang-over signs. The 24 items composing the scale did *not* measure the quantity of alcohol consumed: the scale describes only alcohol-related psychosocial factors for social drinkers. While there is a plethora of research on what is termed 'abusive drinking', the emotional and social correlates of 'sensible drinking' are not generally known across varied samples of social drinkers. Further, while other research has tested the relationship of parent drinking to offspring alcohol use (Cahalan *et al.*, 1969; Edwards *et al.*, 1972), few have tested parent alcohol use in terms of adult offsprings' sensible alcohol use. The SPDS was constructed during prior research on the present sample; it is innovative but it does require further development for general use (Harburg *et al.*, 1989). However, it appears to be a useful measure, and the findings in this article therefore may serve as a report on its external validity.

A number of qualities regarding the data and sample make this study unique in the literature: (1) parent drinking was obtained by self-report in 1960, and adult offspring drinking was also obtained by self-report in 1977; (2) parents' 1960 report occurred when offspring were still largely either residing at home or were young adults in the community, and offsprings' report 17 years later in 1977 when offspring were still largely residing in the same community; (3) the sample was representative of the community; (4) alcohol use ranged from lifelong abstaining to high volume drinking among social drinkers.

These unique data allowed inquiry into the following questions: Does imitation or non-imitation of parent alcohol volume affect whether or not adult offspring are drinking sensibly? What relation does parent volume as well as offspring recall of parent problem drinking have with offsprings' volume and problems with drinking? Can offsprings' sensible drinking be affected by not imitating low volume-problem parents? When parents abstained, what effect on sensible/problem drinking was there for offspring who drank at lower or higher volumes?

In order to answer these questions, this report has the following specific aims: (1) to review the fall-off effect whereby adult offspring consume less alcohol than their high volume parents; (2) to test whether imitation or non-imitation of parent alcohol use affects the sensible/problem drinking of adult offspring; (3) to consider the patterns of imitation and non-imitation by offspring of parental alcohol use; and (4) to raise issues for public health education to further the image of sensible drinking in all its aspects—psychosocial and medical.

Method

Sample

The sample consisted of 420 three-member sets of father, mother and adult son or daughter. Parents' self-reported drinking data were obtained in 1960 as part of the Tecumseh Community Health Study (TCHS), a longitudinal survey of the residents of Tecumseh, Michigan (see Napier *et al.*, 1970, for a description of the project). Drinking data on the offspring were collected in 1977 as part of the Family Health Project, which used the family-set method of sampling. Briefly, in 1977, a list of multi-sibling families was obtained from the 1960 TCHS census. A sample of Tecumseh families was then drawn by a random selection of 'index' persons from among all siblings in each family of the census. In addition to the index, the five-member 'family-sets' consisted of the spouse of the index (if married); a sibling and a first-cousin, both closest in age to the index person; and a randomly-selected, genetically-unrelated person who was matched for age and sex to the index (see Harburg *et al.*, 1977; Moll *et al.*, 1983 for details on the family-set method). Questionnaires were sent to 2272 individuals identified by the family-set selection process, and 74% were returned $N=1672$ total cases).

Analysis of variance on *any* variable shows no significant differences across the roles of index, spouse, sibling, first cousin and unrelated person. Therefore, the family-set roles can be ignored in this study. For the purposes of this analysis, siblings were excluded to avoid intra-family repetition of parental drinking data and possible biasing of results. Past drinkers were also excluded, as their recall of previous drinking practices may have become distorted over time; and for past-drinking parents, there was no means of distinguishing between those who had quit drinking either before or after the time in their children's lives when these parents could exert an early influence. This left 387

valid cases for father-offspring pairs and 390 for mother-offspring pairs.

The final sample of offspring consisted of 48% males and 52% females, who ranged between the ages of 19 and 72, $\bar{X}=34$ years ($SD=\pm 9.5$) at the time of the 1977 survey. When their parents were interviewed in 1960, these offspring were between 2 and 54 years old. Seventy-four per cent of the offspring had been 18 or younger in 1960 and, thus, would be expected to have been living with their parents at the time when the latter completed the TCHS questionnaire. The sample represented the community in being White, of Anglo-Saxon heritage, 82% married, largely of high school education, and residing in the town of about 10,000 population in a rural area of Michigan.

Measures of alcohol use

The methods for measuring alcohol consumption varied slightly for parents and offspring due to the different questionnaire formats in the two surveys. In 1977 the adult offspring responded to 13 items on drinking habits adapted from Cahalan *et al.* (1969). However, both the 1960 and 1977 instruments provided the essential information required to calculate average weekly ethanol intake for parents and offspring according to procedures developed by Jessor (1968) and modified slightly for the 1960 data (DiFranceisco *et al.*, 1986).

The basic method for deriving total ounces of ethanol per week consisted of summing the individual's ethanol intake from beer, wine and liquor. The amount of ethanol for each component beverage is the product of the number of occasions per week that the person drinks the beverage, the number of units per occasion, and the average ethanol content (constant) for that beverage. One ounce of ethanol equals approximately two typical drinks of any alcoholic beverage (Gleiberman & Harburg, 1986). Other analyses using this sample show that the drinking patterns in this small town are similar in relation to various socio-demographic markers to those described in state and national surveys (O'Connell, 1980).

Categories of alcohol use

A seven-category scale of alcohol use was constructed to test the 'fall-off' effect and subdivide the continuous variable of ethanol (oz/wk). These seven categories are the same for father and mother: (1) Abstainer (lifelong), (2) <2 drinks monthly,

(3) 0.5-3 drinks/week, (4) 3.1-6.9 drinks/week, (5) 1-1.9 drinks daily, (6) 2-2.9 drinks daily and (7) 3 or more drinks daily. It should be noted that a number of major studies have considered two drinks a day to be 'heavier drinking' (e.g. Clark & Midanik, 1982; Malin *et al.*, 1985).

A four-category drinking scale was obtained by collapsing categories of the seven-category scale and assuming the following ranges for males and females:

Drinking category	Drinks per week	
	Men	Women
Lifelong abstainer	0	0
Low volume	>0-<3	>0-<3
Medium volume	3-<14	3-<7
High volume	≥ 14 (2+ daily)	≥ 7 (1+ daily)

The term 'abstainer' refers to lifelong abstinence, while the infrequent or rare occasional drinkers were subsumed in the low volume category, for certain analyses explicitly combined abstainers and low volume drinkers together as being 'abstemious' users of alcohol.

The cut points for medium- and high-volume drinking differed by sex for two reasons. First, a number of physiological differences between men and women cause alcohol to be absorbed faster by women: they are generally lighter in weight, have a higher proportion of body fat, and have a smaller proportion of fluid relative to their total weight than do men (Mendelson & Mello, 1985). Since alcohol is not rapidly absorbed by fat, it thus tends to remain at high levels in the blood stream. Also, owing to the smaller amount of fluid, alcohol remains less diluted. Consequently, women generally need less alcohol to feel high or drunk. Secondly, drinking norms for men and women almost always differ within communities and in the nation (Klatsky *et al.*, 1983). In Tecumseh, men drank more than women and the generation of adults in 1977 consumed more than did their parents and other adults in 1960 (Harburg *et al.*, 1980). A comparison of the raw ethanol consumption of both parents and offspring in our sample reiterated these observations. As all data are presented by sex, the differential in criteria are also observed for all analyses, except Tables 1 and 2. In these two tables, ethanol intake was standardized within each sex,

Table 1. Discrepancy between offsprings' (1977) drinking and fathers' (1960) drinking by the level of fathers' (1960) drinking

Fathers' drinking category	Number of father/offspring pairs	Median differences of offspring/father pairs ^a	95% confidence intervals ^b	Differences around the sample median	
				N<	N>
Abstainer	(50)	0.15	(0.14, 0.20)	0	50
<2 drinks/month	(64)	0.18	(0.14, 0.32)	11	53
0.5 to 3 drinks/week	(101)	0.14	(0.11, 0.24)	43	58
3.1 to 6.9 drinks/week	(65)	-0.13	(-0.21, -0.07)	45	20
1 to 1.9 drinks/day	(53)	-0.55	(-0.69, -0.43)	45	8
2 to 2.9 drinks/day	(21)	-1.07	(-1.55, 0.07)	16	5
≥3 drinks/day	(33)	-2.68	(-3.58, -2.19)	33	0
Totals	387	0.12	(0.07, 0.13)		

Kruskal-Wallis Statistic=173.25; $p<0.00001$.

^a Based on drinks per week, standardized (z -scores) by year and sex of parents only.

^b When 0 is included in the 95% confidence interval, the median difference is not significant.

Table 2. Discrepancy between offsprings' (1977) drinking and mothers' (1960) drinking by the level of mothers' (1960) drinking

Mothers' drinking category	Number of mother/offspring pairs	Median differences of offspring/mother pairs ^a	95% confidence intervals ^b	Differences around the sample median	
				N<	N>
Abstainer	(139)	0.03	(-0.01, 0.08)	3	105
<2 drinks/month	(96)	0.002	(-0.03, 0.08)	41	55
0.5 to 3 drinks/week	(93)	-0.15	(-0.20, -0.06)	63	30
3.1 to 6.9 drinks/week	(37)	-1.09	(-1.36, -0.92)	34	3
1 to 1.9 drinks/day	(19)	-2.10	(-3.11, -1.13)	17	2
2 to 2.9 drinks/day	(4)	-4.07	Not computed ^c	4	0
≥3 drinks/day	(2)	-6.69	Not computed ^c	2	0
Totals	390	-0.030	(-0.03, -0.02)		

Kruskal-Wallis Statistic=148.81; $p<0.00001$.

^a Based on drinks per week, standardized (z -scores) by year and sex of parents only.

^b When 0 is included in the 95% confidence interval, the median difference is not significant.

^c N too small to be computed.

which thus adjusts for sex and generation differences.

Sensible/Problem Drinking Scale (SPDS)

An instrument to measure a range of sensible to problem drinking described in detail elsewhere (Harburg *et al.*, 1989), was used to categorize offspring into sensible, border or problem users of alcohol. The criteria used to develop this scale involved a number of alcohol-related traits: (1) social disruption; (2) craving for alcohol; (3) reasons for drinking (escape or simply enjoyment); (4) negative feelings reported when 'high'; and (5) severe hangover signs experienced (see Chart 1).

Social disruption. We used 11 items from the 13-item Short Michigan Alcoholism Screening Test (SMAST) (Selzer *et al.*, 1975) to describe disruptive social consequences from alcohol use. We factor analysed the items and rank-ordered the factor groups as follows: (1) no problems; (2) those who 'can't stop on occasions'; (3) family discord (three items describing family complaints of respondent's drinking); (4) conflict/help-seek group consisting of seven items reporting whether respondents sought help for drinking, and any social conflict experiences, e.g. arrested while driving under the influence (Harburg *et al.*, 1988). The number of problem items and the rank order of the factor group were both taken into account in the scoring and classification system (see Chart 1).

Chart 1. Criteria and rank of 19 subsets for sensible/problem drinking categories

Drinking categories	Ranked subset number	Number of SMAST problems	Criteria					
			External		Internal			
			(1) SMAST ^a ordered groups	(2) Craving	(3) Reasons escape	(4) Negative mood	(5) Severe hangover signs	
I. Sensible								
A. Very Sensible	1	0	[No Problem + Enjoy]	+	Number of any internal criteria			
B. Sensible	2	0	[No problem but Joyless] ^a		None of any internal criteria			
	3	0	[No Problem]	+	Any 1 of 4 internal			
	4	1	[Can't Stop]	+	None of any internal criteria			
II. Border	5	0	[No Problem]	+	2 other <i>except</i> both craving and reasons			
	6	1	[Can't Stop]	+	Any one other internal			
	7	1	[Fam. Dis./ Help Seek]	+	None of any internal criteria			
III. Problem								
A. Unhealthy	8	0	[No Problem]	+	Both craving and reasons			
	9	0	[No Problem]	+	Any 3 other internal			
	10	1	[Can't Stop]	+	Any 2 or 3 other internal			
	11	1	[Fam. Dis./ Help Seek]	+	Any one other internal			
	12	1	[Fam. Dis./ Help Seek]	+	Any 2 or 3 other internal			
	13	2-3	[Fam. Dis./ Help Seek]	+	None of any internal criteria			
	14	2-3	[Fam. Dis./ Help Seek]	+	Either Negative Mood or Hangover			
B. Impaired	15	0-1	[None or any one problem]	+	All 4 other internal			
	16	2-3	[Fam. Dis./ Help Seek]	+	Both craving and reasons			
	17	2-3	[Fam. Dis./ Help Seek]	+	2, 3 or 4 other			
	18	4+	[Fam. Dis./ Help Seek]	+	None or any one other internal			
	19	4+	[Fam. Dis./ Help Seek]	+	2, 3 or 4 other			

^a The measure for external or social consequences of alcohol use derived by Harburg *et al.*, 1988.

^b 'I drink because I enjoy it'. Very true or fairly true = Enjoy; slightly or not at all true of me = Joyless.

Craving. Two items were used: (1) "When you were not drinking, did you find yourself looking forward to having a drink?" and (2) "When you haven't had a drink for several days, do you feel a strong desire to get a drink?". Responses were: 'Yes/No'. A respondent who reports a 'yes' response to one or both items is classified as positive.

Escape. Two items were used: (1) "I drink when I want to forget everything" and (2) "I drink because

I need it when I'm tense or nervous". Responses were: 'not at all true of me', 'slightly true', 'fairly true', 'very true of me'. A respondent who reports 'fairly true' or 'very true' to one or both items is classified as positive.

Negative mood (when high or drunk). Three items were used: "When you were high, tipsy, or drunk, does it make you . . ." (1) sad, depressed, (2) mean, hostile, (3) feel guilty. Responses were: 'not at all

true of me', 'slightly true', 'fairly true', 'very true of me'. A respondent who reports 'fairly true' or 'very true' to at least one of these three items is classified as positive.

Severe hangover signs. Five signs in response to the item: "When you had more to drink than you intended or you got 'drunk', did you have . . ." (1) anxiety, (2) diarrhoea, (3) blackouts, (4) suicide thoughts, (5) tremors. Responses were: 'Yes/No'. A respondent who reports 'yes' to at least one of these items is classified as positive.

Assumptions were then made which rank ordered the experience of alcohol-related emotional pain. Specifically, we assumed that levels of pain were induced in the drinking process by the rank order: (1) social disruption, (2) craving, (3) reasons for drinking: escape, forget, (4) negative affect when 'high/drunk' and (5) severe hangover signs. It was conceived that the criterion of social disruption was the major generator of external sources of pain or the social 'feedback', and criteria 2-5 were the internal sources of alcohol-related, emotional pain or the psychophysiological feedback. Note again that alcohol intake was *omitted* from these criteria. It should also be noted that the 24 items on which these criteria are based were in the context of other items within the larger Family Health Project questionnaire. They were selected for the SPDS from that context and SPDS classifications were made by computer algorithm. Chart 1 shows the three SPDS categories and the classification decisions from which they are logically derived.

Statistical design

One of the aims of this research was to determine whether parent-offspring differences in alcohol use are significant when sex and generation-based variances are controlled. That is, does the average son or daughter, within the context of his/her generation's norm, drink more, the same, or less than did his/her parents by each level of parent consumption? To test this question, the ethanol variables were standardized by conversion to z -scores to adjust for the average differences in consumption by parents and offspring, and by men and women in 1960 and 1977. The standardized ethanol scores of each parent were then subtracted from the standardized scores for their son or daughter, and also from the standardized scores of all offspring regardless of sex.

An earlier report indicated that offspring showed

significant but modest correlation with their parents' drinking patterns (Webster *et al.*, 1989). We sought to discover whether such imitation persisted at all levels of parental drinking by measuring offspring-parent difference in consumption at each level of parent alcohol use. Accordingly, the original variables for father's and mother's ethanol volume in 1960 were recoded into seven categories or levels of drinking that ranged from 0 for abstainers to 3 or more drinks per day. Our choice of statistical tests for analysing the fall-off hypothesis was limited by the fact that while the distributions of z -score differences between offspring and each parent's drinking were normal, nevertheless, *within* each category of parent level, the difference scores were non-normal. We therefore opted for the non-parametric Kruskal-Wallis test of median differences in drinking between offspring and parents at each level of the parents' alcohol consumption. However, regressions of offspring-parent differences on continuous measures of parent intake were also run to test the magnitude of the correlation, R , and the variance explained, R^2 , by the parent's drinking volume. Log linear models were fit to frequency data using the method of iterative proportional fitting (Bishop *et al.*, 1975). Models were screened using a forward selection procedure with the simplest model being chosen. These models have small X^2 values and large significance levels ($p > 0.05$), indicating that the predicted values agree closely with the observed values and the model provides a good fit.

Results

The fall-off effect

Viewing the curves in Fig. 1 and the corresponding data in Tables 1 and 2, it is clear that when the parent drinks at higher levels, the offspring drinks relatively less. The 'fall-off' effect starts for the offspring when the father consumes one or more drinks daily, and the mother approaches daily drinking. For the offspring of parents in the highest parent drinking levels, both curves show almost 100% of these adults drank less than their parents. A patterned failure to imitate in this sample of social drinkers is most evident at the higher levels of parent drinking. At the abstaining and lower levels of parent drinking, the low difference scores between parent and offspring are indicative of more imitation: even though the majority of offspring of abstaining parents do drink, they do so, on average, at low levels of difference. These patterns of

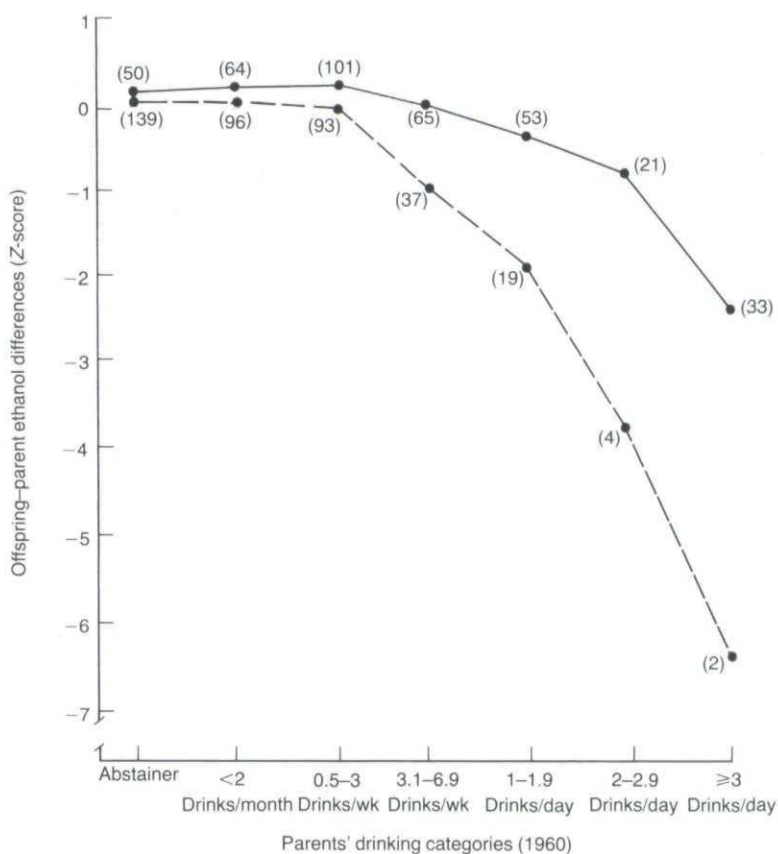


Figure 1. Plotted 'fall-off curves' of median differences in standardized units between offspring (1977) and each parent (1960), by parental drinking level. (—) Offspring-father differences; (---) offspring-mother differences. Standardized units obtained by converting variables of the average weekly ethanol intake of offspring in 1977 and parents in 1960 to z-scores. R (offspring-father on father drinking) = -0.73 ; R (offspring-mother on mother drinking) = -0.70 .

differences across 17 years are highly predictable, as reflected in the correlation coefficients between offspring-parent differences and parents' drinking in Fig. 1 (father, $R = -0.73$; mother, $R = -0.70$). The daughters' differences (data not shown) indicate more predictability ($R = -0.79$ for fathers and -0.71 for mothers) than for sons ($R = -0.67$ and -0.61 respectively).

The 'fall-off' curves in Fig. 1, however, ignore the magnitude of the adult offsprings' alcohol intake. Even if all adult offspring drank less than their high volume parents, it still can be assumed that offspring volume from such families ranged from low (non-imitation) to high (imitation). Data shown elsewhere (Harburg *et al.*, 1990) confirm this. Further, while levels of offspring alcohol use are correlated with the variable of interest here,

namely, the SPDS—for men $R = 0.46$, $R^2 = 0.21$; and for women $R = 0.34$, $R^2 = 0.09$ —nevertheless, these correlations, while significant, are moderate. Therefore one might ask whether, *within* each level of offspring drinking, does *quality* of parental drinking affect the relationship of offspring intake levels and their SPDS score?

Parent problem-signs

An index of signs of parent problem drinking, or 'problem-signs', was next constructed. Adult offspring were asked to recall parent drinking problem signs while the offspring were growing up (up to 13 years of age). The parent was judged retrospectively by the adult offspring to be (1) a 'problem drinker'; or (2) as often being 'tipsy', 'high' or 'drunk'. The third sign was reported by the parents themselves in

1960, that they drank four or more drinks on occasion (significantly more than community norms). The index is dichotomous: 'None' means no signs, and 'Any' refers to the presence of any one or more of the three signs.

In Table 3 the per cent Total column shows the proportions for the three SPDS categories for offspring (by father and mother) to be about 58% sensible, 16% borderline and 26% problem. Not shown, however, are the gender differences. For males, 48%, 15% and 36% are sensible, border or problem drinkers compared, respectively, to females at 70%, 17% and 13% ($p < 0.0001$). Males, as expected, show almost three times more problem drinkers than females, who are, in turn, largely sensible drinkers. Women of course (data not shown) had a smaller total per cent of 'impaired' drinkers (3%) than men (almost 10%) and also showed, conversely, a higher per cent of 'very sensible drinkers' (30%) compared to men (21%).

Table 3 describes the relationship between the SPDS categories of adult drinking and two independent variables: (1) the adult offspring's drinking level in 1977; and (2) whether their parent had 'None' or 'Any' signs of drinking problems. Results show that *within* each offspring drinking level, when the father had *no* problems, the per cent of sensible drinking is greater than when the father had any problem-signs. Conversely, the per cent offspring problem was always more for this latter group. Further, the per cent of offspring who were problem drinkers rose monotonically across the six categories when analysed by fathers' problem signs, from 8% to 58%. For sensible drinkers, the change in per cent decreased monotonically from 80% for 'low drinking offspring-no problem father' to 27% 'high drinking offspring-problem father'. Log linear analysis confirmed these significant associations offspring's problem drinking is related both (1) to the offspring's own level of drinking and (2) to recall of fathers' drinking problems. Having a father with problem signs increases (accelerates) the likelihood of offspring problem drinking at each level of alcohol consumption. For mothers however, while the same trends exist in the pattern of results, the mothers' problem classification is statistically independent of the offspring's SPDS category. The offspring's own drinking level is however again significantly associated with offspring SPDS.

The patterns in Table 3 were also essentially similar (data not shown) for fathers and sons, fathers and daughters, mothers and sons, and mothers and daughters, although there were small

numbers at each drinking level for problem mothers. In sum, low drinking offspring, whether or not the parent had problems, emerge as having the highest per cent of sensible drinkers across all categories, especially if the parent had no drinking problem (75-80%). Conversely, the highest proportion of problem drinkers emerge when the parent had a drinking problem and the offspring is a high volume drinker (58%). When these data were analysed with five SPDS categories ('very sensible', 'sensible', 'border', 'unhealthy', 'impaired') it was noted (data not shown) that when the offspring was a high volume drinker and the father had *any* problem sign ($N = 33$), then only one offspring, or 3%, was 'very sensible' and 39% were 'impaired' compared to 14% 'very sensible' and 23% 'impaired' when the offspring was high volume but the father had *no* problem ($N = 66$).

Imitation and the SPDS categories

Tables 4 and 5 examine the relationships among four variables: parent drinking level, parent problem drinking, offspring volume, and offspring SPDS categories. Drinking levels are here dichotomized into low and high for both parents and offspring. The cut point for high volume drinking for each parent corresponded to the point on Fig. 1 where the offspring fall-off began: (1-1.9 drinks/day for fathers; 3.1-6.9 drinks/week for mothers). To classify offspring drinking, the same cut points used for fathers/mothers were applied to sons/daughters. A number of interesting results now appear. We note that percentage results for Table 4 (fathers and offspring) and 5 (mothers and offspring) appear remarkably similar. When these patterns for Tables 4 and 5 are tested by log linear analysis, the effects of parent volume was *directly* related to offspring SPDS but parent problems appear to be related *indirectly*. Thus for fathers, when the sets of models were fit for this analyses, the model that best fit the data in Table 4 included all first order interaction terms. This model indicated that father's volume was significantly related to (a) offspring drinking level, (b) fathers' problem and (c) offspring SPDS. Offspring drinking level was associated with (a) fathers' problem and (b) offspring SPDS. No interactions involving three or more of these variables fit the data significantly better.

The model that best fit the data given in Table 5 contained three significant interaction terms: offspring drinking level with offspring SPDS; mother

Table 3. Proportions of sensible/problem offspring drinking by volume (excluding abstainers) and parent drinking problem (in column per cents). Adult offspring drinking volume^a and father drinking problem signs^b

Adult offspring drinking SPDS categories	Father problem: Total (%)	Adult offspring drinking					
		Low		Medium		High	
		None (%)	Any (%)	None (%)	Any (%)	None (%)	Any (%)
Sensible	58	80	67	48	44	42	27
Borderline	16	12	13	29	19	16	15
Problem	26	8	20	23	37	42	58
Total (N)	100 (355)	100 (114)	100 (63)	100 (52)	100 (27)	100 (66)	100 (33)

$X^2_6 = 3.61, p = 0.7297$ for loglinear model.

Table 4. Adult offspring drinking volume^a and mother drinking problem signs^b

Adult offspring drinking SPDS categories	Mother problem: Total (%)	Adult offspring drinking					
		Low		Medium		High	
		None (%)	Any (%)	None (%)	Any (%)	None (%)	Any (%)
Sensible	59	75	64	51	40	42	32
Borderline	16	15	11	23	30	15	10
Problem	25	10	25	26	30	43	58
Total (N)	100 (352)	100 (146)	100 (28)	100 (70)	100 (10)	100 (79)	100 (19)

$X^2_6 = 7.90, p = 0.4431$ for loglinear model.

^a Volume in drinks/week:

	Low	Medium	High
Men:	<3	≥3 but <14	≥14 (2+ daily)
Women:	<3	≥3 but <7	≥7 (1+ daily)

^b Parent problem signs: See text.

volume with mother's problem; and mother volume with offspring SPDS.

In sum, it can be seen that for both fathers and mothers, their problem drinking was associated with (1) their own level of use and (2) their own level was related to offspring SPDS category. For both fathers and mothers, offspring alcohol use was also related to their own SPDS category. However, for fathers, both volume and problems were related to offspring volume, whereas these relations were not found to be significant for mothers.

Observing the last two columns (in both Tables 4 and 5), where imitation of parents' high volume by the offspring occurs, the results for adult offspring appear mediated by parents' problem signs. As expected, the highest per cent of problem offspring drinking occurs when the parent and offspring are

both high volume and the parent had a drinking problem: here 54% of offspring are problem drinkers. However, when high volume parents had no drinking problems then only 29% of their high volume offspring are problem drinkers, and 46–50% are sensible. They are even similar in proportion to those low volume and sensible drinking offspring. But the highest percentages of sensible drinking offspring occur for the low volume non-imitators of parental high-volume/no-problem drinkers: 88% (father) and 70% (mother) (plus 6% and 5% abstainers) in contrast to 64% and 66%, for offspring with low volume but problem parents. The per cent of problem drinkers is also lower for low volume offspring with high-volume/no-problem parents, 0% to 10%, compared to about 20% for those with a high-volume/problem father or mother.

Table 4. Imitation and non-imitation of fathers' drinking level by offsprings' level, fathers' problem signs, and relation to SPDS categories of offspring

Fathers' drinking level: ^a	Abstain		Low volume			High volume		
	Low (%)	High (%)	None (%)	Any (%)	Low (%)	None (%)	Any (%)	High (%)
Offsprings' drinking level: ^b								
Fathers' problem signs: ^c	Total %							
Offspring SPDS categories								
Abstain	8	37	10	8	6	5	—	—
Sensible	53	35	69	57	88	64	46	29
Border	15	8	17	15	6	10	25	17
Problem	24	20	4	20	—	21	29	54
Totals	100	100	100	100	100	100	100	100
N=	(386)	(40)	(103)	(40)	(17)	(42)	(24)	(24)
Row totals %	100	10	27	10	4	11	6	6

$X^2_{1,4} = 21.59, p = 0.0875$ for loglinear model.

^a Fathers:

Low volume: 0.1 drinks per month-6.9 drink per week.

High volume: 1 or more drinks per day.

^b Offspring:

Sons: same as fathers.

Daughters: same as mothers.

^c See text.

Table 5. Imitation and non-imitation of mothers' drinking level by offsprings' level, mothers' problem signs, and relation to SPDS categories of offspring

Mothers' drinking level: ^a Offsprings' drinking level: ^b Fathers' problem signs: ^c	Abstain			Low volume			High volume		
	Low	High	Total %	Low	High	Total %	Low	High	Total %
	(%)	(%)		None (%)	Any (%)	None (%)	Any (%)	None (%)	Any (%)
Offspring SPDS categories									
Abstain ^d	27	—	9	7	6	—	—	—	—
Sensible	46	50	53	74	55	40	31	70	31
Border	14	15	15	15	11	17	23	15	15
Problem	13	35	23	4	28	43	46	10	54
Totals	100	100	100	100	100	100	100	100	100
N=	(99)	(40)	(388)	(89)	(18)	(67)	(13)	(20)	(13)
Row totals %	26	10	100	23	5	17	3	5	4

$X^2_{18} = 19.92, p = 0.3334$ for loglinear model.

^a Mothers:

Low volume: 0.1 drinks per month-3 drinks per week.

High volume: more than 3 drinks per week.

^b Offspring:

Sons: same as fathers.

Daughters: same as mothers.

^c See text.

Offspring who imitate low volume/no problem parents, show the next highest proportions of abstainers plus sensible drinkers (79–81%) and the lowest per cent of problem drinkers (4%); however, when either parent has a problem, these low drinking offspring have 5–7 times more problem drinkers (20–28%). When offspring do not imitate their low drinking parents, and become high volume drinkers, then unexpectedly higher proportions of problem drinking offspring emerge (over 40%) with respect to each parent, and highest for low-volume fathers with problems (55%). In these families, apparently, non-imitation may exact a toll on the offspring, or some of these parents may be binge drinkers. A relatively similar pattern, but with lower percentages, is shown by non-imitating offspring of abstaining mothers, where 35% of high volume offspring are problem drinkers compared to only 13% of the low volume drinkers. When fathers are the abstaining parent ($N=10$), the per cent of problem drinking offspring is 20%, regardless of offspring volume.

Thus the lowest per cent of problem drinking does not occur for offspring of abstainers, but for offspring of low drinking parents with no problems whose offspring imitated their parents' volume: here, only 4% of offspring were problem drinkers. Patently, however, the highest per cent of offspring who were abstainers, and therefore with no, or only psychological, alcohol-related problems (Eward *et al.*, 1986) also had abstaining parents. Here imitation has its rewards *vis-à-vis* alcohol problems, if not for other health concerns, e.g. mortality rates (Cahalan, 1981; Turner *et al.*, 1981; Baum-Baicker, 1985).

Discussion

Imitation/non-imitation by adult offspring of alcohol-related parent behavior was examined in the context of the 'fall-off effect' and of sensible/problem alcohol use, two processes which tend to constrain drinking. Evidence indicates there is more imitation by adult offspring of abstemious parents (both abstainer and low volume) than of high volume parents. Adult offspring drink significantly less, on the average, than their high volume parents, a phenomenon here termed 'fall-off effect' for both men and women with respect to either their fathers or mothers. This fall-off among social drinkers appears when the mother approaches or the father consumes at or more than a typical daily drinking level (≥ 1 drink per day). More sensible drinking

occurs among adult offspring when (1) the parent has no drinking problem-signs than when the parent has drinking problems (this pattern appears at all levels of offspring consumption), and (2) when parents drink high volume and have no problem for those offspring who do not imitate parent volume.

Sensible/problem drinking appears to be associated directly with level of parent alcohol use, and offsprings' own drinking level (as imitation or non-imitation of parents), and indirectly with offsprings' recall of problematic intake by their parents. Other factors, not analysed in this article, are also related to sensible/problem alcohol use, e.g. early age of regular drinking, emotionality (Harburg *et al.*, 1989). However, the focus of the current article is on imitation/non-imitation by offspring of alcohol-related parent behavior. There is prior evidence, of more imitation by offspring of abstemious parents (both abstainer and low volume) than of high volume parents (Webster *et al.*, 1989; Harburg *et al.*, 1990). Results from this analysis also confirm this. Adult offsprings' drinking levels are significantly less, on average, than their high volume parents, a phenomenon here termed 'fall-off effect' for both men and women when compared to either their fathers or mothers. This fall-off appears when the mother approaches or the father consumes at or more than a daily drinking level, a daily ritual here briefly termed, 'higher volume' among social drinkers. This fall-off effect is associated with significantly more sensible drinkers among adult offspring when the parent has no drinking problem-signs than when the parent has problems. Further, this pattern appears at all levels of offspring consumption.

There are many problems inherent in measuring effects over time in human affairs. In community samples there will always be small numbers of high volume drinkers, especially for mothers. Even repeated testing of the fall-off effect will usually result in similar empirical and logical questions. A patent issue concerns the idea of a regression to the mean. This statistical result occurs in repeated measures of the *same* individuals between times of measurement: highest scores drop, lowest scores rise and the Time 2 measures 'regress to the mean'. Obviously these elements are not present here where the *parents'* drinking scores in 1960 are related to their differences with an *offspring's* score in 1977, on a measurement scale of conventional physical units of alcohol, measured in ounces per week and standardized for year and sex before differences are compared. Nevertheless, a logical argument may hold that regression to the mean still

occurs only at both endpoints or in the extreme categories. Thus, if the parent was an abstainer (1960) then the offspring might be expected to drink at relatively higher levels than the parent; and, at the other extreme, if the parent drinks at very high levels, the offspring can be expected to drink relatively and significantly less. Empirically then one would expect a linear relationship, with the two endpoints (abstaining and high volume) appearing sharply more and sharply less from a line of no difference. This did not occur for one extreme, namely abstaining parents and offspring, where offspring were: (1) more often abstainers themselves; (2) more often low volume drinkers (even though the high majority drank); and (3) less often high volume drinkers compared to other same-sex offspring (of drinking parents). Still it may be asserted that a random effect may happen only at higher parental drinking levels. This, of course, is no longer the usual meaning of regression to the mean. But even in this extreme case, there are two factors which argue against this position. First, "we note that if subjects are chosen without regard to the extremity of the variable of interest . . . there is no regression to the mean effect" (Davis, 1976). Second, the fall-off effect described in this paper is similar to what has been detected in other populations, e.g. Edwards *et al.* (1972) and Cahalan & Room (1974), but not interpreted as a fall-off effect.

Beneficial consequences appear when the offspring do *not* imitate their higher volume parents' drinking levels, and are themselves 'abstemious' (abstain or low volume) and the parents have *no* drinking problems (75-94% were sensible users). When the offspring volume imitated their high volume parents who also had drinking problems, then the majority of adult offspring, 54%, were problem drinkers. These same results yielding higher offspring problem drinkers also held when the parents were *low* volume drinkers, but the offspring did *not* imitate and became high volume adult drinkers. Here, roughly 44-55% of adult offspring were problem drinkers. *The most sensible drinking by adults occurred not when parents abstained but when parents (a) were low volume, had no problems and the offspring initiated their volume; and (b) when the parents were high volume with no problems but the offspring was a low volume, non-imitator.* We can speculate that low volume offspring probably also imitated other parental alcohol-related behaviors, i.e. avoiding adverse social consequences of drinking, low frequency of getting

drunk, and taking on (imitating) sensible reasons for drinking and enjoying 'occasional' usage. We suggest that sensible drinking by adult offspring therefore becomes shaped by an image of parental sensible drinking derived partly from parent intake-related behaviors (of which 'amount' is not the only important indicator) and partly from alcohol-related psychosocial factors.

Thus, to investigate intrafamilial transmission of alcohol use, one should not separate in theory or research the crude intake amount from the alcohol-related attitudinal and socio-emotional behaviors accompanying intake behaviors. As an illustration, examine the transmission pattern of the abstaining parent and their adult offspring drinking. Recall that about 30% of Americans are abstainers (Johnson *et al.*, 1977). Our data (Tables 4 and 5) show parental abstention is associated with a high proportion of abstaining offspring; and even though the majority of offspring drink, they do so in largely sensible proportions.

What characterizes offspring who imitate the parent drinking level and what characterizes those who do not? A prior article presented data which generated several hypotheses that more imitation occurred between offspring and their same-sex parent; and non-imitation was associated with cross-sex parent drinking, especially for the only female, single child showing a negative correlation with father's drinking level (Harburg *et al.*, 1982).

In the present project there were trends (data not shown) suggesting that the conditions most conducive to 'fall-off' or aversion to a high volume parent would occur when: the cross-sex parent has drinking problem signs, and is mild in religious beliefs; the offspring loves the parent relatively less, is low on neurotic-impulsive traits and feels aversive to the parent's drinking behaviors. Whereas imitation of 'abstemious' (abstainer or low volume) parents would more often occur when: the dominant parent has relatively strict religious beliefs and has no drinking problem signs; the offspring has strong affection for both parents, is low on neurotic-impulsive traits and themselves have relatively high religious beliefs and church attendance. These are hypotheses which must be pursued by further research about imitation and non-imitation of parent drinking style by adult offspring.

In our search for family conditions related to sensible/problem adult offspring drinking, results in this article (Tables 4 and 5) show that approximately 30% of offspring remained sensible drinkers even under conditions leading to the highest propor-

tion of problem drinking: namely, a high volume parent with drinking problems and high volume offspring intake. Assuming a strongly held recall by these offspring, then what factors might allow this significant subset to emerge? Perhaps the influence of an abstemious, emotionally-significant other person has an influence, namely, the 'other' parent, the spouse, a sibling, a friend. Or, simply, religious/moral beliefs could prevent imitation of the alcohol-related problem behavior of the parent. One could then imitate high volume intake only, but little else. Similarly, for the 3-10% of offspring who do not imitate abstaining parents and who themselves drink at high volume levels, about 50% are sensible drinkers; this per cent is in turn similar to high volume offspring with high-volume/no-problem parents. The study of how adults become sensible drinkers has many leads yet to be examined. For example, when elderly parents reduce their drinking, does this also influence their middle-age offspring? We have speculated about about a 'life-phase' hypothesis elsewhere (Gleiberman *et al.*, 1990).

The concept of 'sensible social drinking' as defined by the SPDS used in this project assumes that intake of ethanol and other aspects of intake, e.g. daily drinking, maximum drinking, ought not be used alone to assess sensible drinking. These intake measures must be combined with psychosocial alcohol-related behavior, e.g. social consequences, reasons for drinking, moods when drunk, hangover signs, *emotional stability and religiosity in order to understand how sensible drinking as a total set of critical behaviors* can be defined. Conversely, how can we define the 'problem social drinker', who is not 'alcoholic'? Their proportions are highest when (1) they imitate the high volume of problem parents or (2) when they do not imitate the low volume of problem parents or (3) when they do not imitate abstaining mothers, where 20-35% of high volume offspring are problem drinkers.

In the attempt to measure sensible social drinking, there is as much difficulty in measuring 'volume' or ethanol level as there is classifying levels of general 'emotionality'. Current quantity-frequency measures of average alcohol intake cannot distinguish between (a) the low volume drinker who 'binges' occasionally and (b) the steady low volume drinker. Even the units of volume are not standardized and are difficult to compare across studies (Gleiberman & Harburg, 1986). Does parent binge drinking behavior have an impact on offspring sensible usage, even when the actual intake is low,

e.g. for women who get drunk with an 'average' two drinks per week and report trouble in the family? (Harburg *et al.*, 1988). Are the rituals and routine behaviors of 'daily' drinking accompanied by positive or negative emotional expression? (Neff & Husaini, 1982). Current measures of general 'emotional adjustment', independent or not of alcohol-related behavior are varied, numerous, and of less than desired reliability and validity across different populations and samples.

The criteria and measures used to construct the present sensible/problem drinking scale tried to avoid such pitfalls by excluding both measures of volume and general emotionality. In the full development of the SPDS, however, it must also include measures of intake-related behaviors such as amount (oz/wk); frequency of drinking occasions per week, and of being drunk; usual drinks per occasion; frequency of times over 'usual'; ability to stop intake on social drinking occasions; enjoyment with an absence of negative affect; age first drunk or tipsy; parent problem drinking; parent attitudes to alcohol use; and attitude toward abusive intake. Thus, a single scale can yield classification of a 'very sensible' social drinker at one end and an 'impaired' (perhaps 'alcoholic') at the other end. The final development of such a scale will take further years of research.

Such effort however, is of high priority if we are to learn how sensible/problem drinking behaviors might be transmitted through familial and socializing influences and to test for interactions with hereditary material. Biological capacity for 'abstention' or 'addiction' or 'craving' can only be understood by studying their interactions with environmental/psychosocial factors; the interaction may either release 'uncontrolled' drinking behavior or *conversely* facilitate lifelong abstention or low volume use. An explicit model of sensible drinking therefore can provide high priority knowledge for basic research, public health educators, physicians, and media campaigns to portray living models of 'sensible drinkers' (Kendell, 1987).

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