

Trends in Alcohol's Harms to Others (AHTO) and Co-occurrence of Family-Related AHTO: The Four US National Alcohol Surveys, 2000–2015

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ABSTRACT: Various harms from others' drinking have been studied individually and at single points in time. We conducted a US population 15-year trend analysis and extend prior research by studying associations of depression with combinations of four harms – family/marriage difficulties, financial troubles, assault, and vandalism – attributed to partners or family members. Data come from four National Alcohol Surveys conducted by telephone in 2000, 2005, 2010, and 2015 (analytic sample = 21,184). Weighted logistic regression models estimated time trends adjusting for victim characteristics (gender, age, race/ethnicity, marital status, poverty, employment, family history of alcohol problems, and drinking maximum). The 2015 survey asked the source of the harm; we used similar models to examine characteristics, including anxiety and depression, associated with various combinations of family/marriage, financial, and assault harms due to partner's/spouse's/family members' drinking. A significant upward trend ($P < 0.001$) from 2000 to 2015 was seen for financial troubles but not for other harms due to someone else's drinking. In 2015, depression and/or anxiety were strongly associated with exposures to harms and combinations of harms identified as stemming from drinking spouse/partner and/or family members. The results shed new light on 15-year trends and associations of harms with personal characteristics. A replicated finding is how the victim's own heavy drinking pattern is implicated in risks for exposures to harms from someone else's drinking. Documenting risk factors for and mental health impacts is important for interventions to reduce alcohol's harm to others.

KEYWORDS: family, alcohol's harms to others, depression, trends, population surveys

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Introduction

US population trend studies of alcohol's harms based on the respondent's own drinking have extensively examined patterns of drinking and factors associated with resultant problems. Trend studies also have included alcohol consumption patterns,^{1–4} including age–period–cohort decompositions of such trends.^{5,6} These trend studies have included alcohol problems and consequences due to the respondents' own drinking,^{7,8} as well as those consequences associated with drinking in certain contexts.⁹ Trend studies have also examined the treatment for alcohol problems^{10,11} as well as trends in injunctive drinking norms,¹² pressure to change drinking,¹³ and alcohol policy opinions.¹⁴

We are unaware of any US trend studies to date that address the likelihood over time of experiencing harms from other drinkers, which alternatively are called alcohol's externalities,¹⁵ or so-called secondhand effects of drinking.¹⁶ One New Zealand study examined the trends in alcohol-involved vehicle crashes and rates of prosecutions for alcohol-related disorder offenses from the 1990s through early 2000s.¹⁷ Additionally, a recent Australian report examined alcohol's harms to others (AHTO) in a short-term longitudinal study.¹⁸ However, no similar US study has been identified. Thus, the first aim of the present study is to examine 15-year trends in AHTO experienced during the prior 12 months among US adults. We used four comparable National Alcohol



Surveys (NASs) that each included a standard set of such questions, as well as control variables previously found to be associated with harms.^{15,19}

Investigating AHTO²⁰ is important because those who experience such harms tend to show greater support for stronger alcohol policies.²¹ By analogy with the tobacco control experience, documenting the extent of impacts of alcohol's secondhand effects may potentially help in enacting stronger alcohol regulations.¹⁶ Recently, we have added a US data point¹⁹ to the growing literature that shows experiencing alcohol's harms from other drinkers is associated with significantly lower quality of life^{22,23} and worse mental health.^{24,25} We have argued that, although based on cross-sectional data ruling out a strict causal interpretation, such associations are more likely to be the result of emotional responses to unsettling harms from other drinkers than the reverse (eg, more depressed people attract more harms to them).¹⁹ Additional evidence supporting this directionality is the observation that those so harmed engage in more help-seeking.²⁶

To date, studies of harms from others' drinking, including mental health consequences, have focused primarily on analysis of single harms. For instance, in our recent US study using 2010 NAS data,¹⁹ family/marriage difficulties, financial troubles, being pushed/hit/assaulted, and having property vandalized – all attributed to another person's drinking – each individually showed a strong association ($P < 0.001$) with depression. All harms except assaults by another drinker were also associated ($P < 0.05$) with distress.

Neither Greenfield et al.¹⁹ nor others have examined models including mental health of those who experience substantive combinations of specific harms from others' drinking, although some published reports have used summary scores (such as 1+ or 2+ harms) based on the assessment of a series of harms.¹⁵ For example, we have noted that family and financial harms are more often experienced by women (presumably from partners' heavy drinking), while assaults and vandalism are more often experienced by men (and often attributed to strangers' drinking).²⁷ This suggests that exposure to certain harms may logically group together. This scoring of groups of harms was used in a recent study by Karriker-Jaffe and Greenfield,²⁷ in which we found that neighborhood disadvantage moderated the harm by gender relationships of two subscales made up of these pairs of items (family and/or financial; assaults and/or vandalism).

Thus, for the second aim of the present study, using the 2015 NAS dataset only, we considered only the harms from other drinkers that respondents attributed to a spouse or partner or to another family member. Our interest was to investigate the associations, specifically with depression and anxiety, of each of the different harms as well as combinations of them. Examples of such combinations are relationship difficulties co-occurring with financial harms or relationship difficulties co-occurring with assault during the prior 12 months, with both harms attributed to the drinking of intimate partners or family members.

To summarize, our objectives were to fill two gaps in the US literature: (1) by studying 15-year trends in the four harms asked in each of the last four NAS questionnaires, adjusting for a number of personal characteristics and (2) in the 2015 NAS, which included perceived sources of the four harms, to study the four harms attributed to drinking by intimate others and/or family members individually and in combination. In this second aim, we emphasized associations with anxiety and depression, while controlling for a range of variables potentially affecting both mental health status and harms from intimate others.

Methods

Surveys. Data from the last four NASs, with essentially identical survey items, were pooled: the 2000 NAS (N10, $n = 7,612$), 2005 NAS (N11, $n = 6,919$), 2010 NAS (N12, $n = 6,855$), and 2015 NAS (N13, $n = 6,623$). All the surveys were computer-assisted telephone interviews, gathered from adults aged 18 and older, and based on list-assisted random digit dialed sampling with informed consent. The Institutional Review Board (IRB) of the Public Health Institute, Oakland, CA, USA, approved all the surveys.

The IRB-approved consent script began all NAS surveys, informing potential participants that a) the study is funded by the National Institutes of Health; b) questions are “about health related issues such as the experience of injuries, violence, and some background questions such as your age and marital status...[as well as] attitudes, opinions and use of alcohol and drugs even if you do not drink alcoholic beverages or use drugs”; c) they were randomly selected as “one of more than 7,000 persons”; d) the information provided is important “for treatment and policy on health-related issues”; e) participation is voluntary; f) they have a right to skip questions if uncomfortable; g) they have a right to postpone or end the interview at any time; h) answers will be confidential and “entered into the computer in a form that does not allow any answer to be identified with any personal identifying information [and] grouped with those of all the other participants”; and i) the survey will take about 20–45 minutes. Further, a telephone number was provided if they wanted more information.

In the 2010 and 2015 surveys, IRB-approved compensation was \$10 or \$20 depending on condition (landline vs. cell phone, and/or minority oversample). In 2005, the AHTO questions were balloted for an approximate one-half of the randomized subsample. Therefore, given missing data, the samples for harm analyses included 7,607, 2,360, 5,382, and 5,835, for N10–N13, respectively, totaling 21,184 cases. Cooperation rates ranged from 52% to 60% (mean 55.5%). In all the years, interviews were conducted in English or Spanish as needed. Hispanic/Latino and Black/African American respondents were oversampled every year, and weighting used respective epochs' Census data to correct for gender, age, race/ethnicity, and nonresponse, so that weighted data are representative of the US noninstitutionalized adult population residing in all



50 states plus Washington DC at the time of data collection. Other publications provide further details on N10–N12 survey methods.^{28,29} The 2015 NAS (N13) used a dual-frame (landline/mobile) random digit dialed sampling method, so respondents who completed the interview via mobile phone are included. In Table 1, percentages are weighted and total sample sizes are unweighted.

Measures. We used four dichotomous items assessing AHTO^{15,19} derived from the 1989 Canadian Alcohol and Other Drug Survey³⁰ – family problems or marriage difficulties; financial trouble; being pushed, hit, or assaulted; and having property vandalized by someone who had been drinking – each experienced (or not) during the prior 12 months (current impacts). For trend analyses, items were considered individually.

For analyses of associations with depression and anxiety, the harms were combined in various ways. Two domains represented by two items each were previously used in a study of neighborhood effects on harms.²⁷ These domains were family-related harms consisting of family or marriage difficulties and financial harms ($r = 0.45$) and aggression-related harms involving assault and vandalism ($r = 0.32$). The items in each domain involve one more widely and one less widely endorsed items (Table 1).

Available for the first time in the 2015 NAS (N13) were follow-up items asking the source of the harms from other drinkers. Analyses for our second aim focus on only the harms where the victim reported that the perpetrator was a spouse, partner, or another family member. Thus, we omitted harms caused by friends, coworkers, or strangers. No information on the drinking behaviors of the perpetrator was available.

Depression and anxiety. Two questions that screen for depression and two that screen for generalized anxiety disorder were included in N13. The Patient Health Questionnaire-2 (PHQ-2) consists of two Diagnostic and Statistical Manual of Mental Disorders, 4th Edition (DSM-IV) diagnostic core criteria for depressive disorders,³¹ and the Generalized Anxiety Disorder (GAD-2) Scale consists of the two core criteria for generalized anxiety disorder.³¹ The GAD-2 is an effective screening tool for panic, social anxiety, and post-traumatic stress disorders. Summary scores for PHQ-2 and GAD-2 each range from 0 to 6. For the PHQ-2 and the GAD-2 scales, scores of ≥ 3 were suggested as cutoff points between the normal range and probable cases of depression or anxiety, respectively.³² Using the four items together (referred to as the PHQ-4) in our categorical coding, we constructed a variable as follows: 0 = not depressed or anxious (< 3 on both subscales, reference group in analyses); 1 = meets depression criterion (2.4%); 2 = meets anxiety criterion (3.8%); and 3 = meets both criteria (0.9%).

Personal and demographic characteristics. Personal and demographic characteristics included as controls were respondent's gender, age (18–29, 30–39, 40–49, 50–59 vs. ≥ 60 as reference), marital status (married/cohabiting, separated, divorced, widowed, vs. never married as reference), employment status (employed as reference vs. unemployed, retired, homemaker, and others – disabled, never worked, etc.), a dummy variable indicating household income below the respective poverty line (a standard measure taking account of the number of dependents in the family), and two dummy variables indicating Hispanic and Black/African American, in

Table 1. Sample personal characteristics and harms by survey year – weighted percentages or means (unweighted sample Ns).

SURVEY YEAR (ANALYTIC SAMPLE) ^a	2000 (7,607)	2005 (2,360) ^b	2010 (5,382)	2015 (5,835)
Respondent sex (Male%)	47.7	49.2	48.8	48.0
Black/African American%	11.7	15.6	11.3	12.5
Hispanic/Latino%	10.5	19.4	13.1	14.9
Age – Mean (SD)	47 (14)	47 (14)	50 (14.5)	51 (15)
Marital Status: married/living with	64.5	66.7	64.1	59.2
Separated/divorced	10.4	9.2	8.3	12.5
Never married	18.5	18.9	21.0	22.4
Income below poverty line for survey year	12.3	16.6	17.2	16.1
Employment status: employed	66.0	64.4	54.8	60.4
Unemployed	3.5	5.0	9.0	6.1
Parent or other blood relative had alcohol problems	49.0	48.1	45.4	46.3
Maximum drinks in any day (with 0): last 2 months – mean (SD)	3.2 (4.9)	3.1 (4.4)	3.1 (4.5)	3.3 (4.5)
Harms from other drinkers: family or marriage difficulties	4.6	3.4	3.9	3.7
Financial troubles	1.2	1.2	1.9	1.9
Assault (pushed, hit, assaulted)	4.2	2.8	3.4	3.8
Vandalized/destroyed property	2.6	1.8	2.6	2.8

Notes: ^aSamples with data on harms from other drinkers. ^b2005 Survey involved an approximately one-half random ballot for such harm items.



each case vs. other groups, mostly Euro-Americans. Because the experience of depression may be associated both with harms from both others' drinking and the respondent's own alcohol use,^{33,34} we included past-year maximum number of drinks consumed in a day.³⁵ To allow for potentially nonlinear relationships, the respondent's maximum number of drinks was taken as the mid-point of each of the seven categories (no drinking = 0 as reference, 1–2 = 1, 3–4 = 2, 5–7 = 6, 8–11 = 9.5, 12–23 = 17.5, and 24+ = 25 drinks). Adverse childhood experiences, especially alcohol problems in the family when growing up, also are associated with the risk of depressive disorders in adulthood³⁶ and likely increase the risk of harm due to another person's drinking. We therefore included a dichotomous variable "lived with or had a blood relative with a history of alcohol problems."

Analyses. Binary logistic regression models were estimated for each 12-month harm. Logistic regression models also were used in N13 for harms and harm combinations attributed to spouses, partners, and family sources. All models adjusted for personal characteristics identified earlier. In the 4-survey trend analyses, survey year (2000 as reference) was the focus, while for the analyses limited to N13, anxiety, depression, or both was the focus. Tables 2 to 5 present adjusted odds ratios (aORs) as indicators of effect size which quantify how strongly the presence or absence of a given harm from other drinkers (or combination of such harms from specific sources in N13) is associated with time (in the trend analysis) or depression and anxiety (in the 2015 data analyses). In both the instances, adjustment of the ORs takes into account all the other independent variables included in the models.

Results

Samples. As seen in Table 1, specific control variables' rates or means differ across sample years. In some instances, this may be due to specific survey characteristics, which, though not differing greatly over the period, did involve some variation, such as length of interview and conditions then prevailing. One example is age, where it became more difficult to reach younger respondents (the dual landline/mobile design in N13 was partly designed to ameliorate this situation). Owing to large sample sizes, many differences were significant (statistics not shown). For this reason, as well as substantive interest in the covariates, multivariable binary logistic regression models controlled for all personal characteristics.

Trend analyses. Table 2 provides a summary of the logistic regression analyses predicting 12-month financial troubles (due to drinking of any perpetrator, as this was not ascertained in the first three surveys). Adjusting for all other covariates, compared to 2000 levels, there was a greater likelihood of reporting financial troubles due to others' drinking in 2010 (aOR = 1.4; $P < 0.05$) and in 2015 (aOR = 1.5; $P < 0.01$), but not in 2005, with each compared to 2000. Those with financial harms attributed to others' drinking were much more likely to be women (men had about half the odds compared to women); slightly less likely to be Black; more often aged either 18–29 or 30–39, groups which had odds from about 2.5 to 3 times higher than those aged 60 and over, respectively; more often unemployed compared to employed; and much more likely (aOR ~ 3) to have incomes below the poverty line. Additionally, those with family histories of parents and/or blood relatives with alcohol problems were much

Table 2. Logistic regression model (all survey years) predicting financial harms from other drinkers by survey year and covariates.

	ADJUSTED ODDS RATIO	WALD STATISTIC	P	95% CI
Intercept	0.003	234.8	<< 0.00001	–
Respondent sex (reference: female)	0.462	31.40	<< 0.00001	(0.352–0.605)
Black verses other race/ethnicity	0.687	3.948	= 0.047	(0.474–0.995)
Hispanic verses other race/ethnicity	0.566	8.458	= 0.004	(0.386–0.831)
Age (5-category; ref 60+) – overall	^a	12.17	= 0.016	–
Marital status (5 category; ref: never married) – overall	^b	7.729	= 0.102	–
Income below poverty line (in year-of-survey)	2.886	59.26	<< 0.00001	(2.203–3.780)
Employment status (5 category; ref: employed) – overall	^c	14.81	= 0.0051	–
Parent or blood relative had alcohol problems	2.791	49.46	<< 0.00001	(2.097–3.716)
Maximum/day 12 months (7-level; ref abstain) – overall	^d	73.30	<< 0.00001	–
Survey year (reference 2000 survey)	–	9.03	= 0.029	–
2005 survey	1.010	0.002	= 0.965	(0.640–1.593)
2010 survey	1.403	4.578	= 0.032	(1.029–1.913)
2015 survey	1.503	6.869	= 0.009	(1.108–2.039)

Notes: ^aaORs at all age levels are significantly higher than 60+ ($P < 0.01$), especially ages 30–39, aOR = 2.88 (CI 1.59–5.24) and ages 18–29, aOR = 2.51 (CI 1.34–4.70). ^baOR for separated is significantly higher than never married ($P = 0.016$), aOR = 2.49 (CI 1.18–5.52). ^caOR for unemployed is significantly higher than for employed ($P = 0.002$), aOR = 1.84 (CI 1.25–2.70). ^daOR reduced vs. abstaining at lower maximums (eg, 1–2 drinks, aOR = 0.63 (CI 0.45–0.87) but elevated at 24+ drinks aOR = 4.84 (CI 2.92–8.02).



more likely (aOR ~ 3) to experience financial problems from others' drinking.

Equivalent results (not shown) for family/marital difficulties from others' drinking yielded similar results for covariates but showed very different trend patterns. In this instance, only the 2005 survey showed a slight decrease relative to 2000 in family/marital harms from other drinkers, other things equal (aOR = 0.71; confidence interval [CI] 0.54–0.93). All ages below 60 showed elevated aORs ranging from 2.4 to 3.7, with age 19–29 highest, and ages 30–39 and 40–49 showing aORs of ~3 relative to ages 60+. Perhaps not surprisingly, those separated (but not divorced) reported much higher levels of family/marital difficulties, with aOR >3, than never-married respondents. Poverty and unemployment were significant but not nearly as influential as for financial harms, and family of origin history of alcohol problems was equally strong with an aOR of ~3. In this case, both Black and Latino respondents showed lower levels of family harms from others' drinking.

As regards assaults from other drinkers (results not shown), a similar time trend to that for family/marital difficulties was seen, with significantly lower ($P < 0.05$) assault in 2005 than 2000 (aOR = 0.69; CI 0.51–0.92). Notably, in contrast to family and financial harms, men had significantly more assaults from other drinkers than women (aOR = 1.27; CI 1.06–1.51) and Black individuals more than others (aOR = 1.76; CI 1.42–2.18). The younger the age group, the higher the odds of being pushed, hit, or assaulted by other drinkers, with aORs of 5.0, 3.1, and 2.9 for ages 18–29, 30–39, and 40–49, respectively (compared with those aged 60+). Again, those below the poverty line and respondents with a

family history of alcohol problems experienced more assaults from other drinkers. Employment was not influential. The recipient's own drinking maximum showed a dose–response relationship above 1–2 drinks, with aORs monotonically increasing from 1.35 ($P < 0.05$) for 3–4 drinks to 10.8 for 24 or more drinks ($P < 0.0001$), all with fairly narrow CIs given that the overall Wald statistic for maximum was 289.

Similar to the trends for the harms other than financial harm, in the final trend result (not shown) for having one's property vandalized by another drinker, the 2005 level was a slightly lower (aOR = 0.69; CI 0.48–0.99) than in 2000, but there were no further differences. While gender was not significant ($P = 0.06$), the aOR at 1.21 suggests that men experienced more vandalism than women. Other covariate results were similar to those for assaults, although associations were less strong. For example, own maximum, though significant, showed less association with an overall Wald statistic of only 64; 3–4 drinks showed some elevation ($P < 0.05$; aOR = 1.40), and the two highest maximum levels were strongly significant (12–23 and 24+ drinks with aORs of 2.83 and 3.30, respectively, and each $P < 0.00001$). Poverty was not significantly related.

Harms from spouses/partners and/or family members in 2015. Harms from intimate others and/or family members were studied for individual harms and combinations of them. The models had identical covariates to the trend analyses excepting in place of survey year, we introduced the PHQ-4-based variable assessing depression, anxiety, or both (see Measures section). An example analysis for an individual harm, summarized in Table 3, presents the logistic regression model predicting family/marital difficulties attributed to the

Table 3. Logistic regression model (2015 data) predicting family harms from other drinkers (spouse/partner or family member/s).

	ADJUSTED ODDS RATIO	WALD STATISTIC	P	95% CI
Intercept	0.010	107.2	<< 0.00001	–
Respondent sex (reference: female)	0.514	15.74	= 0.00007	(0.370–0.714)
Black verses other race/ethnicity	0.709	1.941	= 0.104	(0.437–1.150)
Hispanic verses other race/ethnicity	0.616	3.891	= 0.049	(0.381–0.997)
Age (5-category; ref 60+) – overall	^a	7.536	= 0.008	–
Marital status (5 category; ref: never married) – overall	^b	10.164	= 0.38	–
Income below poverty line (in year-of-survey)	3.338	20.50	<< 0.00001	(1.981–5.624)
Employment status (5 category; ref: employed) – overall	^c	6.265	= 0.003	–
Parent or blood relative had alcohol problems	3.487	40.01	<< 0.00001	(2.368–5.134)
Maximum/day 12 months (7-level; ref abstain) – overall	^d	11.809	= 0.066	–
Depression/anxiety (reference: none)	–	36.78	<< 0.00001	–
Depression	2.798	5.320	= 0.021	(1.167–6.707)
Anxiety	4.329	32.58	<< 0.00001	(2.617–7.159)
Both depression and anxiety	0.282	0.705	= 0.401	(0.015–5.413)

Notes: ^aAge: only ages 18–29 is significantly elevated compared to 60+ (aOR = 2.82; CI 1.35–5.90); though not significant, the direction of age groups to 59 is similar. ^bMarital status: only being divorced (vs. never married) was protective for family harms from spouse/partner/family members (aOR = 0.29; CI 0.14–0.64). ^caOR for unemployed is significantly higher than for employed ($P = 0.01$), aOR = 1.9 (CI 1.2–3.1). ^daOR elevated vs. abstaining at maximum = 3–4 drinks, aOR = 1.8 (CI 1.1–2.8) and at 5–7 drinks, aOR = 2.1 (CI 1.2–3.5).



spouse, partner, or family member. Controlling for covariates, respondents reporting these family/marital difficulties in the last 12 months tended to be more depressed ($P < 0.05$), with aOR ~ 3 , or were considerably more anxious ($P < 0.00001$) with an aOR > 4 , but experiencing both conditions together was unrelated to this harm.

As regards covariates, women experienced more family/marital difficulties by drinking spouses/partners and/or family members than did men. Those in the 18–29-year-old group tended to have more such harms from these sources compared to the oldest group, but other age groups did not differ, though showing the same direction. An interesting difference from the trend result for family harms from any source was that such harms from intimate others and family members in 2015 were significantly lower for divorced people compared to never-married respondents, but married or separated people showed no difference. Poverty was uninformative, but the unemployed were prone to more harms than those employed. Own maximum intake at 3–4 and 5–7 drinks in any day was associated with elevated risks of reporting family/marital difficulties by spouse/partners and/or family members. Drinking problems within the family of origin was highly associated with harms from these sources.

For financial harms attributed to partners or family members, after controlling for all other covariates that may themselves affect depression levels, strong associations with depression ($P < 0.01$), anxiety ($P < 0.0001$), and both depression and anxiety ($P < 0.001$) were found (results not shown but provided in Supplementary Table 1). The aORs were 3.8, 4.6, and 7.1, suggesting that those experiencing financial trouble

attributed to the drinking of spouses, partners, or family members are substantially at risk of mental health problems.

Considering financial troubles together with family/marital difficulties, both attributed to the same close sources (Table 4), women tend to evidence more combined family and financial harms than men and being below the poverty line or unemployed exacerbates the risk of having both these harms from the drinking of intimates and/or family members. Both one's own heavy drinking and drinking problems in the family of origin were also associated with higher risks of experiencing the combined family and financial troubles from such near sources.

The associations with depression and anxiety are summarized in Table 5 for several other combinations of harms attributed to spouse/partners and/or family members. Family/marital difficulties together with pushing, hitting, or assault from drinking partners or family members are associated with elevated anxiety. When assaults happen together with financial troubles, either depression ($P < 0.05$) or anxiety ($P = 0.00001$) is associated. When all three harms (family, financial, and aggression) from intimates or family members occur, either depression ($P < 0.01$) or anxiety ($P < 0.0001$) is associated, but in both the latter cases, there is no sign of both conditions being jointly involved in these harms. Conversely, if any of the three harms from close sources occur, one is likely also to report anxiety or both anxiety and depression ($P = 0.001$).

Discussion

To our knowledge, this is the first US paper examining trends in a number of harms from other people's drinking based on

Table 4. Logistic regression model (2015 data) for family and financial harms from drinking spouse/partner or family member/s.

	ADJUSTED ODDS RATIO	WALD STATISTIC	P	95% CI
Intercept	0.0001	36.80	<< 0.00001	–
Respondent sex (reference: female)	0.526	4.600	= 0.032	(0.292–0.946)
Black verses other race/ethnicity	0.659	1.026	= 0.311	(0.294–1.478)
Hispanic verses other race/ethnicity	0.422	3.277	= 0.070	(0.166–1.074)
Age (5-category; ref 60+) – overall	^a	5.048	= 0.279	–
Marital status (5 category; ref: never married) – overall	^b	6.015	= 0.198	–
Income below poverty line (in year-of-survey)	2.503	8.475	= 0.004	(1.350–4.641)
Employment status (5 category; ref: employed) – overall	^c	22.21	= 0.0002	–
Parent or blood relative had alcohol problems	5.186	16.27	= 0.00005	(2.331–11.54)
Maximum/day 12 months (7-level; ref abstain) – overall	^d	20.79	= 0.002	–
Depression/anxiety (reference: none)	–	37.10	<< 0.00001	–
Depression	8.009	15.49	= 0.0008	(1.395–10.14)
Anxiety	6.833	27.70	= 0.00001	(2.336–9.073)
Both depression and anxiety	<0.001	<0.001	= 0.997	–

Notes: ^aAge overall NS, but 30–39, 40–49, and 50–59 age levels significantly higher than 60+ (all P 's < 0.05), aOR = 14.9 (CI 1.09–204) to 17.1 (CI 1.3–238).

^bMarital status overall NS but divorced shows lower risk of both harms together than never married ($P < 0.05$), aOR = 0.263 (CI 0.083–0.833). ^caOR for unemployed is significantly higher than for employed ($P = 0.0002$), aOR = 5.0 (CI 2.4–10.4). ^daOR elevated vs. abstaining at maximum = 3–4 drinks, aOR = 3.7 (CI 1.7–8.0); 8–11 drinks, aOR = 3.0 (CI 1.06–8.5; and 24+ drinks, aOR = 6.6 (CI 2.0–22).

**Table 5.** Summary of regression models for other harm combinations (2015 data) drinking spouse/partner or family member/s.^a

	ADJUSTED ODDS RATIO	WALD STATISTIC	P	95% CI
Family and assault: depression/anxiety (reference: none)	–	19.16	= 0.00003	–
Depression	3.197	1.963	= 0.164	(0.622–16.44)
Anxiety	6.004	18.18	= 0.00002	(2.634–13.68)
Both depression and anxiety	0.499	0.107	= 0.744	(0.008–32.38)
Financial & assault: depression/anxiety (reference: none) ^b	–	25.71	= 0.00001	–
Depression	7.403	4.138	= 0.042	(1.076–50.94)
Anxiety	6.833	24.96	<< 0.00001	(4.666–34.09)
Both depression and anxiety	1.938	0.168	= 0.682	(0.082–45.86)
All three harms ^c : depression/anxiety (reference: none)	–	32.79	<< 0.00001	–
Depression	17.925	7.948	= 0.005	(2.410–133.3)
Anxiety	18.924	27.70	= 0.00001	(2.336–9.073)
Both depression and anxiety	<0.001	<0.001	= 0.997	–
Any of three harms ^c : depression/anxiety (reference: none)	–	42.54	<< 0.00001	–
Depression	2.075	3.161	= 0.075	(0.928–4.640)
Anxiety	3.981	32.12	<< 0.00001	(2.469–6.420)
Both depression and anxiety	4.726	11.34	= 0.001	(1.914–11.67)

Notes: ^aCovariates are the same as those in Table 3. ^bNote that financial and vandalism values (Wald statistics, aORs, and CIs) are very similar to those for financial and assault. ^cFamily/relationship, financial trouble, and assault harms (ie, excluding vandalism) all attributed to a spouse/partner or family member).

a series of comparable, cross-sectional national population surveys. Four NAS telephone surveys allowed us to investigate trends in four types of AHTO over a 15-year period. One notable trend was that for financial harms, in which there were higher odds of experiencing these in 2010 and 2015 vs. 2000. Thus, financial harms attributed to family members' or partners' drinking may have increased after the global economic downturn that hit hard in 2008 and 2009. (The data collection for the 2010 survey began in the second half of 2009.) Economic recovery was incomplete by the time the 2015 survey began in 2014. Unemployment rates were higher in the latter two surveys than the earlier (Table 1), especially in 2010. The percentages of those below the poverty line were higher in the last three surveys than in 2000. Of course, we include these control variables in our models, but a limitation is that it is likely that not all impacts of the economic downturn are captured in these adjustments. For example, housing foreclosures or having to take a lower paying job were not examined.^{37,38}

As regards 2015 financial problems due to someone else's drinking, while perceived family support has been found to have a moderating effect on alcohol problems,³⁹ family discord and financial problems together may have the opposite effect. Therefore, this combination is likely to be associated with anxiety or depression (or both in the case of financial harms) stemming from drinking of intimate others and family members. An additional limitation we acknowledge is that in these NAS datasets we do not have any variables assessing the drinking others' drinking or drug use. We do not, for example, know if

collaterals' alcohol use involves acute heavy drinking, chronic alcoholism, or both.

We believe that the trend results for the other three harms from others' drinking (family, assault, and vandalism), which showed a lower level in 2005 compared to 2000, are likely to be a survey artifact rather than a substantive change. No overall trend, such as observed for financial troubles from others' drinking, was seen. We expect that the result may be related in some way to the smaller sample in 2005 due to the random balloting of the harm items to reduce the length of the survey (we have not repeated this strategy subsequently). The randomized ballot did include racial/ethnic oversample cases, however. Although we surmise an artifact, this is not definitively assured as an explanation, and it is possible that a substantive cause for the difference is involved as well.

One inherent limitation is the nature of cross-sectional surveys, which cannot establish causality. Regarding the trend analyses, this should not be a major problem. Our group has successfully conducted and published numerous trend studies using the NAS series. Trend analyses are viable because of the surveys' high degree of methodological similarity, relatively large sample sizes (except for the 2005 balloted items), and repeated use of standardized items. A limitation is that some variables of interest to our analyses, such as urban vs. rural residence, were not consistently available and could not be included.

Our findings on depression and anxiety with 2015 population data extend those presented for the 2010 survey¹⁹ in three ways. First, we included the source of the harms reported as due to the drinking of spouses/partners and/or family members



(not coworkers, friends, or strangers). This information is part of the WHO-Thai Health Alcohol's Harm to Others questionnaire protocol⁴⁰ adopted in a streamlined fashion for the 2015 NAS. In this way, we were able to locate these harms experienced by the respondent in the matrix of the family and partners, ie, in an intimate social context. As noted earlier, a limitation is that we do not know, in the N13 survey, the drinking behaviors of these perpetrating collaterals.

Second, another improvement is that we utilized a well-known, brief screening measure with established psychometrics, the 4-item PHQ-4 screener.³² This screener taps both DSM-IV depressive and generalized anxiety disorders.³¹ Together, these conditions have sometimes been termed psychological distress.^{41,42}

Finally, we considered the potentially differing associations when two or three of the harms were reported (stemming from the same close drinking sources). We did not include vandalism in the set of combinations of harms because the number of cases reporting all four of the harms was too small for meaningful interpretation. A limitation is that even in the analysis with all three harms (family, financial, and aggression) from partners and family members, there remains somewhat limited statistical power (despite the large sample size). These results must therefore be considered provisional. (Numbers and power are much more adequate for the analysis estimating any of the three harms).

In conclusion, the results presented here shed new light on both 15-year trends in alcohol's externalities and associations of harms from another person's drinking with numerous personal characteristics. A clear, replicated finding is the extent to which the victim's own heavy drinking pattern is implicated in risks for exposures to particular harms and combinations of harm. This association between harms from other drinkers and the victim's own drinking has been identified in the US literature since at least 1985.⁴³ Our study reveals how these externally inflicted harms (individually and in combination with one another), within the context of heavy drinking (sometimes by the victim but always attributed to close others), are associated with indicators of two important mental health conditions – anxiety and depression, even after adjusting for a number of personal characteristics that may affect either the exposure to harms or the mental health outcomes, or both. Studying whether and if so which of these variables may moderate the relationship between combinations of experiencing harms from various heavy drinking sources and deleterious mental health is an important later agenda.

Concerns about family members' drinking are widely reported cross-culturally, not only in the US.⁴⁴ Generally, it has been argued that documenting impacts of harms, including associations with mental health detriments, is important in making the case that alcohol control policies should be strengthened.¹⁶ Additionally, such information can assist in designing specific indicated prevention strategies to

mitigate such harms to others.²¹ Further, because partners who have been victimized by other drinkers in the family are often heavy drinkers themselves, screening and treatment – especially for women – need to assess the possible role of heavy drinking partners and family members.⁴⁵ In future research using a newly collected US dataset, based on an adaptation of the WHO-Thai Health protocol,⁴⁰ we will be able to examine the respondents' reports of the collaterals' quantity and frequency of drinking. Doing this should provide additional insights about the specific mechanisms by which heavy alcohol use in the family potentiates alcohol-related victimizations.

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Author Contributions

Conceived and designed the study and directed data collection: TKG, KJK-J. Drafting and editing the manuscript, interpreting its findings, and drawing its conclusions: TKG, KJK-J, LMK, WCK, SCW. All the authors reviewed and approved the final manuscript.

Supplementary Material

Supplementary Table 1. Logistic regression model (2015 data) predicting financial harms from other drinkers (spouse/partner/family member/s).

REFERENCES

- Greenfield TK, Midanik LT, Rogers JD. A 10-year national trend study of alcohol consumption 1984–1995: is the period of declining drinking over? *Am J Public Health*. 2000;90(1):47–52.
- Greenfield TK, Ye Y, Kerr WC. Trends from 1990 to 2010 in percentages of US men and women who exceed low-risk drinking guideline. In: 140th Annual American Public Health Association Meeting and Exposition, San Francisco, CA, October 27–31; 2012.
- Kerr WC, Greenfield TK, Midanik LT. How many drinks does it take you to feel drunk? Trends and predictors for subjective drunkenness. *Addiction*. 2006;101(10):1428–37.
- Kerr WC, Mulia N, Zemore SE. U.S. trends in light, moderate, and heavy drinking episodes from 2000 to 2010. *Alcohol Clin Exp Res*. 2014;38(9):2496–501.
- Kerr WC, Greenfield TK, Bond J, Ye Y, Rehm J. Age, period and cohort influences on beer, wine and spirits consumption trends in the US National Surveys. *Addiction*. 2004;99(9):1111–20.
- Kerr WC, Greenfield TK, Bond J, Ye Y, Rehm J. Age-period-cohort modeling of alcohol volume and heavy drinking days in the US National Alcohol Surveys: divergence in younger and older adult trends. *Addiction*. 2009;104(1):27–37.
- Caetano R, Clark CL, Greenfield TK. Prevalence, trends, and incidence of alcohol withdrawal symptoms: analysis of general population and clinical samples. *Alcohol Health Res World*. 1998;22(1):73–80.
- Midanik L, Greenfield TK. Trends in social consequences and dependence symptoms in the United States: the National Alcohol Surveys, 1984–1995. *Am J Public Health*. 2000;90(1):53–6.
- Nyaronga D, Greenfield TK, McDaniel PA. Drinking context and drinking problems among black, white and Hispanic men and women in the 1984, 1995 and 2005 U.S. National Alcohol Surveys. *J Stud Alcohol Drugs*. 2009;70(1):16–26.
- Korcha RA, Polcin DL, Kerr WC, Greenfield TK, Bond J. Pressure and help seeking for alcohol problems: trends and correlates from 1984 to 2005. *Addict Behav*. 2013;38(3):1740–6.
- Weisner C, Greenfield TK, Room R. Trends in the treatment of alcohol problems in the U.S. general population, 1979 through 1990. *Am J Public Health*. 1995;85(1):55–60.



12. Greenfield TK, Room R. Situational norms for drinking and drunkenness: trends in the U.S. adult population, 1979–1990. *Addiction*. 1997;92(1):33–47.
13. Polcin DL, Korcha R, Greenfield TK, Kerr WC, Bond JC. Twenty-one year trends and correlates of pressure to change drinking. *Alcohol Clin Exp Res*. 2012;36(4):705–15.
14. Greenfield TK, Ye Y, Giesbrecht N. Alcohol policy opinions in the United States over a 15-year period of dynamic per capita consumption changes: implications for today's public health practice. *Contemp Drug Probl*. 2007;34(4):649–80.
15. Greenfield TK, Ye Y, Kerr WC, Bond J, Rehm J, Giesbrecht N. Externalities from alcohol consumption in the 2005 US National Alcohol Survey: implications for policy. *Int J Environ Res Public Health*. 2009;6(12):3205–24.
16. Giesbrecht N, Cukier S, Steeves D. [Editorial] Collateral damage from alcohol: implications of 'second-hand effects of drinking' for populations and health priorities. *Addiction*. 2010;105(8):1323–5.
17. Huckle T, Pledger M, Casswell S. Trends in alcohol-related harms and offences in a liberalized alcohol environment. *Addiction*. 2006;101(2):232–40.
18. Laslett A-M, Callinan S, Mugavin J, Jiang H, Livingston M, Room R. *Beyond the Drinker: Longitudinal Patterns in Alcohol's Harm to Others*. Canberra, Australia: Centre for Alcohol Policy Research, Turning Point Alcohol and Drug Centre; 2015.
19. Greenfield TK, Karriker-Jaffe KJ, Kerr WC, Ye Y, Kaplan LM. Those harmed by others' drinking in the US population are more depressed and distressed. *Drug Alcohol Rev*. [In press]. 2015 Sep 1. doi: 10.1111/dar.12324. [Epub ahead of print]
20. Casswell S, Harding JF, You RQ, Huckle T. The range and magnitude of alcohol's harm to others: self-reported harms experienced by a representative sample of New Zealand adults. *N Z Med J*. 2011;124(1336):75–84.
21. Greenfield TK, Karriker-Jaffe KJ, Giesbrecht N, Kerr WC, Ye Y, Bond J. Second-hand drinking may increase support for alcohol policies: new results from the 2010 National Alcohol Survey. *Drug Alcohol Rev*. 2014;33(3):259–67.
22. Casswell S, You RQ, Huckle T. Alcohol's harm to others: reduced wellbeing and health status for those with heavy drinkers in their lives. *Addiction*. 2011;106(6):1087–94.
23. Livingston M, Wilkinson C, Laslett A-M. Impact of heavy drinkers on others' health and well-being. *J Stud Alcohol Drugs*. 2010;71(5):778–85.
24. Ferris JA, Laslett A-M, Livingston M, Room R, Wilkinson C. The impacts of others' drinking on mental health. *Med J Aust*. 2011;195(3):S22–6.
25. Laslett A-M, Room R, Ferris J, Wilkinson C, Livingston M, Mugavin J. Surveying the range and magnitude of alcohol's harm to others in Australia. *Addiction*. 2011;106(9):1603–11.
26. Mugavin J, Livingston M, Laslett A-M. Seeking help because of others' drinking. *Drug Alcohol Rev*. 2014;33(1):161–8.
27. Karriker-Jaffe KJ, Greenfield TK. Gender differences in associations of neighbourhood disadvantage with alcohol's harms to others: a cross-sectional study from the USA. *Drug Alcohol Rev*. 2014;33(3):296–303.
28. Kerr WC, Greenfield TK, Ye Y, Bond J, Rehm J. Are the 1976–1985 birth cohorts heavier drinkers? Age-period-cohort analyses of the National Alcohol Surveys 1979–2010. *Addiction*. 2013;108(6):1038–48.
29. Korcha RA, Polcin DL, Greenfield TK, Kerr WC, Bond J. Pressure to change drinking behavior: an exploratory analysis of U.S. general population subgroups. *J Drug Issues*. 2014;44(4):457–65.
30. Eliany M, Giesbrecht N, Nelson M, Wellman B, Wortley S. Alcohol and Other Drug Use by Canadians: A National Alcohol and Other Drugs Survey (1989) Technical Report. Ottawa: The Unit; 1992.
31. American Psychiatric Association. *Diagnostic and Statistical Manual of Mental Disorders (DSM-IV)*. 4th ed. Washington, DC: American Psychiatric Association; 1994.
32. Löwe B, Wahl I, Rose M, et al. A 4-item measure of depression and anxiety: validation and standardization of the Patient Health Questionnaire-4 (PHQ-4) in the general population. *J Affect Disord*. 2010;122(1–2):86–95.
33. Aneshensel CS, Huba GJ. Depression, alcohol use, and smoking over one year: a four-wave longitudinal causal model. *J Abnorm Psychol*. 1983;92(2):134–50.
34. Caetano R. Alcohol use and depression among U.S. Hispanics. *Br J Addict*. 1987;82(11):1245–51.
35. Greenfield TK, Kerr WC. Alcohol measurement methodology in epidemiology: recent advances and opportunities. *Addiction*. 2008;103(7):1082–99.
36. Chapman DP, Whitfield CL, Felitti VJ, Dube SR, Edwards VJ, Anda RF. Adverse childhood experiences and the risk of depressive disorders in adulthood. *J Affect Disord*. 2004;82(2):217–25.
37. Mulia N, Zemore SE, Murphy R, Liu H, Catalano R. Economic loss and alcohol consumption and problems during the 2008 to 2009 U.S. recession. *Alcohol Clin Exp Res*. 2014;38(4):1026–34.
38. Zemore SE, Mulia N, Jones-Webb RJ, Lui H, Schmidt L. The 2008–2009 recession and alcohol outcomes: differential exposure and vulnerability for black and Latino populations. *J Stud Alcohol Drugs*. 2013;74(1):9–20.
39. Murphy RD, Zemore SE, Mulia N. Housing instability and alcohol problems during the 2007–2009 US recession: the moderating role of perceived family support. *J Urban Health*. 2014;91(1):17–32.
40. World Health Organization. Master Research Protocol. Harm to Others from Drinking: A WHO/Thai Health International Collaborative Research Project. Geneva, Switzerland: WHO; 2012.
41. Kessler RC, Neighbors HW. A new perspective on the relationships among race, social class, and psychological distress. *J Health Soc Behav*. 1986;27(2):107–15.
42. Kessler RC, Barker PR, Colpe LJ, et al. Screening for serious mental illness in the general population. *Arch Gen Psychiatry*. 2003;60(2):184–9.
43. Fillmore KM. The social victims of drinking. *Br J Addict*. 1985;80(3):307–14.
44. Ólafsdóttir H, Raitasalo K, Greenfield TK, Allamani A. Concern about family members' drinking and cultural consistency: a multi-country GENACIS study. *Contemp Drug Probl*. 2009;36(1–2):59–83.
45. Miller BA, Wilsnack SC, Cunradi CB. Family violence and victimization: treatment issues for women with alcohol problems. *Alcohol Clin Exp Res*. 2000;24(8):1287–97.