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Risk factors for conduct disorder among Navajo Indian men and women

Abstract *Objectives*: To describe the risk factors for conduct disorder before age 15 among Navajo Indians. Methods. The study was based on a survey of a stratified random sample of adult Navajo Indians between the ages of 21 and 65 living on and adjacent to two different areas of the Navajo Reservation. There were 531 male and 203 female respondents. The average age (SD) of the men was 38.7 (10.5) years and of the women 35.5 (9.0) years. Conduct disorder was diagnosed retrospectively using the Diagnostic Interview Schedule first developed for the Epidemiological Catchment Area study. The responses were combined into a continuous scale. *Results*: Significant risk factors for increased scores on the conduct disorder scale were: histories of physical and sexual abuse in childhood; abusive maternal drinking; a small number of households per camp; younger age; and being male rather than female. Measures of social status and religion in which subjects were raised were not significant. *Conclusions*: Many of the risk factors that are associated with conduct disorder in other populations are also risk factors in the Navajo population. There is suggestive evidence that some of these risk factors have become more common since World War II, raising the possibility that conduct disorder has become more prevalent, as is thought to be the case nationwide.

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Introduction

There is widespread agreement in the literature on conduct disorder that, whatever role biological causes might play, the social environment is of enormous importance (Moffitt 1993; Lyons et al. 1995). Studies from several different national populations indicate that among environmental causes, family disruption, discord, and abusive behavior and peer effects are especially significant (Offord et al. 1986; Vellemen 1992a, b). Moreover, there is some reason to believe that the prevalence of conduct disorder among young people has been increasing (Loeber 1990; Robins and McEvoy 1990; Moffitt 1993; Achenbach and Howell 1993; Hinshaw 1994). The causes may have to do with changes in family organization as well as with long-term changes in the economy of developed nations. For example, Moffitt (1993) has proposed that the growing gap between the increasingly early age of physical maturation and the increasingly late age at which adult roles are

assumed accounts for the secular trend of increasing delinquency in the adolescent years.

The prevalence of conduct disorder varies among studies as a function of both the population and the criteria and instruments used. In general, however, figures for children range from about 1 to 10–11% (Offord et al. 1986; Robins and McEvoy 1990; Zoccolillo 1993). Though there is debate on the issue, girls seem to have lower rates than boys. In the Epidemiologic Catchment Area study, lifetime prevalence of conduct disorder (prior to age 15) diagnosed retrospectively among men aged from 18 to over 65 was 16.7%. Among women it was 3.8% (calculated from Robins et al. 1991: 265–266).

Most people with conduct disorder in childhood and adolescence do not go on to have serious difficulties in adulthood, but many do (Robins et al. 1991: 266). As a matter of definition, conduct disorder before age 15 is a requirement for anti-social personality disorder at older ages. It is also a risk factor for substance abuse of various sorts as well as a number of other psychiatric conditions (Robins and Price 1991). It is thus significant for both prognostic and prevention purposes.

In a series of studies of alcohol use by Navajo women and men over the past three decades, we have observed several related phenomena (Levy and Kunitz 1974; Kunitz and Levy 1994). Heavy alcohol consumption by men was widely reported from the late nineteenth and early twentieth centuries. This often resulted in untoward consequences such as accidental deaths, a strain on family budgets, and ill health. Most men outgrew their heavy alcohol use by their late 30s or early 40s, but there was a subset who appeared to be at especially high risk of premature death. These men seemed to manifest behavior compatible with a diagnosis of anti-social personality disorder, for which conduct disorder before age 15 is a necessary but not sufficient condition.

It was our impression that among Navajo Indians behaviors compatible with diagnoses of conduct disorder and anti-social personality disorder were becoming more common – the result of growing up in settlements where the constraints imposed by kinship obligations had been much attenuated, and where peer groups of unrelated male drinking companions had become increasingly significant. In such settings, family disruption seemed to be increasingly common. This was partially accounted for by the fact that old forms of heavy drinking provided the model emulated by young men (and, increasingly, young women), who were, however, freed of the constraints imposed not simply by kinship obligations but also by the difficulties encountered by earlier generations of obtaining alcoholic beverages in the absence of good roads, motor vehicles, and a cash economy (Levy and Kunitz 1974; Kunitz and Levy 1994).

The present study was designed to examine the degree to which conduct disorder before age 15 is indeed a risk factor for alcohol dependence in the Navajo population. Elsewhere we have shown that:

1. Among both Navajo women and men conduct disorder occurring before age 15 is a risk factor not simply for alcohol dependence but also for more extreme forms of alcohol-related problems as well as for non-alcohol-related problems (Kunitz et al., in press).
2. The prevalence of conduct disorder before age 15 among adults diagnosed retrospectively in a manner similar to that used in the Epidemiologic Catchment Area study is 22.2% among Navajo men and 12.3% among Navajo women – considerably higher than the prevalence rates reported from the ECA sample, although unadjusted for differences in social class distributions.
3. The lifetime prevalence of alcohol dependence is 70% among men and 29% among women – again much higher than the ECA sample.
4. The amount of alcohol dependence in the population attributable to conduct disorder is not high – no more than 10% among both men and women.

Because of the high prevalence of conduct disorder and its importance as a risk factor for the more extreme manifestations of alcohol- and non-alcohol-related problems, in this paper we examine some of the risk factors that account for it.

The setting

The Navajo Reservation includes about 24,000 square miles (62,440 Km^2) in northwestern New Mexico, north central and northeastern Arizona, and southwestern Utah. In 1990 there were 225,298 Navajos enumerated by the US Census, 146,001 of whom lived in "Indian Country" on and near the reservation.

The original reservation was created by treaty in 1868. It has been expanded several times since then by Executive Order. Despite the expanding land base, however, by the first decades of this century it had become evident to government officials that the livestock population was expanding even more rapidly and threatened to damage the range irreparably. This was a view with which most Navajos did not concur. Nonetheless, the Bureau of Indian Affairs instituted a stock reduction program, which completely shattered the Navajos' pastoral economy and the system of social stratification based upon it (Aberle 1966).

The destruction of the livestock economy and the increasing availability of jobs in the Civilian Conservation Corps, followed soon after by military service and/or war-related employment during World War II, all involved Navajos increasingly in wage work and the cash economy. Dramatic changes continued after the war, as increasing proportions of young people were enrolled in schools and as an increasing proportion of the population moved from the rural hinterland to agency towns (where various tribal and government agencies provide jobs and services) on reservation, or off reservation entirely to border towns and more distant cities.

At present virtually no one can live only from livestock. Unemployment is high: among men aged 16 and above, 23.5%; among women, 18.6%, according to the 1990 US Census. Of those who are employed, most work in the service sector for tribal or other government agencies. Others work on or near the reservation in extractive industries such as mining and lumber.

Subjects and methods

Sampling procedure

The present paper is based upon a case-control study designed to examine the association between conduct disorder in childhood and adolescence and alcohol dependence in adulthood. The cases were women and men between the ages of 21 and 65 from the Shiprock and Tuba City service units, Indian Health Service catchment areas on the northeastern and western parts respectively of the reservation. The cases were enrolled in inpatient and outpatient alcohol treatment programs. The single most important source of referral was the legal justice system. None of the cases are included in the analyses in this paper, however, as it focuses only on the controls because, as demonstrated below, the controls are an unbiased sample of the adult population whereas the cases are a highly selected group of especially severe alcoholics.

Controls were matched to cases by sex, age, and community of residence and were drawn randomly from lists provided by the Indian Health Service (IHS). The lists were of all people with an address within either service unit who had been seen at any IHS facility (inpatient or outpatient) for any cause between 1982 and 1992, just prior to the start of field work. Services of the IHS are provided free of charge to Indians on and near the reservation. It has thus been the major source of health care to Navajos in the area, and this source of names has proven to be an adequate sampling frame in previous studies (e.g., Kunitz and Levy 1991). Because it is a list of all people seen at least once in a hospital or clinic over a 10-year period, however, mobility is a problem. Many people seen 10 years previously but never again may well have moved or died in the interim. Estimates of the success with which individuals were first located and then interviewed range from 30% for the youngest cohort to 65% for the oldest, reflecting the very high mobility of the young, particularly of young men.

Interviewing was to continue until a non-alcohol-dependent control was found to match each case. This could not always be accomplished. In the end there were 204 male cases, 374 male alcohol-dependent controls, and 157 male non-alcohol-dependent controls; and 148 female cases, 60 alcohol-dependent controls, and 143 non-alcohol-dependent controls. Alcohol-dependent controls were significantly less severely alcoholic than the matched cases (Kunitz et al., in press). In this paper, however, alcohol dependence is not considered. Our concern is with the prevalence, antecedents, and history of conduct disorder, and for this purpose only the 531 male and 203 female controls are used in this paper. Their average ages (SD) are: men, 38.7 (10.5) years; and women, 35.5 (9.0) years.

The non-treatment population was sampled within strata defined by age in 5-year intervals, sex, and community of residence. Corresponding to each case (CAS), interviews were conducted with demographically similar respondents until a non-alcohol-dependent control (NADC) was found or until four alcohol-dependent controls (DEPs) had been encountered. The resulting sample of controls (NADCs and DEPs) is not biased in terms of alcohol dependence, as can be seen by the following argument.

Consider all *first* interviews: the probability of encountering a DEP is the proportion of DEPs in the population sampled (i.e., individuals demographically similar to the CAS considered). Denote this proportion p. Next consider all *second* interviews (of whom there will likely be fewer than first interviews), and again the probability of encountering a DEP is p, since the same population is sampled. Similarly for the third interviews, the fourth, etc. So, for each order of interview, the probability of a DEP is p. Overall, adding up whatever the proportions of first, second, third, etc. interviews may be, the probability of encountering a DEP is still p. In other words, the method of sampling is unbiased for the proportion DEP, as was to be demonstrated.

The frequency of sampling within each stratum was determined by the number of treatment cases found in the stratum. Thus, for each treatment case in a stratum, it was intended to sample the population at large (non-treatment) until the first non-alcoholic was encountered. In fact, as noted above, sampling was discontinued after a while. The resulting stratified sample is representative of the age-sex-locality distribution of the treatment cases, and differs from that of the population at large. This distribution was compared with population data from the 1990 Census and is described elsewhere (Kunitz et al., in press). To adjust for these sampling strata, we have created a 12-fold stratification variable combining age (< 50 years, 50 years and above), sex, and community of residence (border town, agency town, other reservation community), which is used in the analyses reported below. (Age 50 is used as the cut point both because women above that age are under represented among the controls due to their under representation among the cases, and also because previous studies in this population suggested large generational differences existed above and below that age.) That is, the significance of risk factors is assessed, given stratification.

Our sample of controls was unbiased within strata determined by the distribution of the cases, as has been explained. It is therefore legitimate to infer from statistical associations in this sample to similar associations in the adult Navajo population, and in particular, from the association of conduct disorder with various risk factors, as discussed in the present paper. Since alcohol dependence is correlated with conduct disorder, one might expect alcohol dependence to be associated with similar risk factors as conduct disorder. It is therefore of interest to disentangle these two associations and an attempt to do so has been made in a companion paper (Kunitz et al., in press), which examines the partial correlations between alcohol dependence and the risk factors, given the conduct disorder variable. Since, however, conduct disorder has been defined as occurring before age 15, and thus its presence or absence must precede the occurrence of alcohol dependence, its association with risk factors must be studied without regard to any possible later occurrence of alcohol dependence. This, indeed, is done in the present paper.

Interview protocol

The interviews were very extensive and included the questions from the Diagnostic Interview Schedule (DIS) designed for the Epidemiological Catchment Area (ECA) Study (Robins and Regier 1991), which allowed for the diagnosis of conduct disorder. The version we used had been revised to match the criteria in DSM-III-R. The criteria refer to the period before age 15 and include three or more of the following:

1. Was often truant
2. Ran away from home overnight at least twice while living in parental or parental surrogate home (or once without returning)
3. Often initiated physical fights
4. Used a weapon in more than one fight
5. Forced someone into sexual activity with him or her
6. Was physically cruel to animals
7. Was physically cruel to other people
8. Deliberately destroyed others' property (other than by fire-setting)
9. Deliberately engaged in fire-setting
10. Often lied (other than to avoid physical or sexual abuse)
11. Has stolen without confrontation of a victim on more than one occasion (including forgery)
12. Has stolen with confrontation of a victim (e.g., mugging, purse-snatching, extortion, armed robbery)

We used the total number of affirmative answers to the relevant series of questions in the DIS: this is referred to as ASYES. ASYES is non-negative by definition, as it is a count. The maximum frequency of ASYES is at the value of 0, after which frequencies decrease with increasing value. When samples are taken from such distributions, the standard deviation is usually not constant, but is larger or smaller when the mean is larger or smaller, respectively. This violates the assumptions underlying common statistical techniques such as analysis of variance, regression, and so on, but suitable transformations such as the logarithmic usually reduce skewness and stabilize variability and thus are closer to these assumptions. The following analyses of the conduct disorder scale are therefore in terms of logASYES [actually, to avoid the problems with ASYES values of 0, for which the logarithm is not defined, the transformation used is log(ASYES + 1), which also counteracts skewness and stabilizes variability].

In addition to items from the DIS, there were extensive questions having to do with family, occupational, marital, educational, substance-use, and drinking histories, and histories of physical and sexual abuse. The questions concerning abuse were not part of a standardized instrument. Informants were asked whether they had ever been abused sexually and/or physically, and then were asked to describe what had occurred. Examples were given if the informant was uncertain what was meant. Unlike the questions regarding alcohol use and childhood misbehaviors consistent with conduct disorder, abuse has not been a subject of widespread and open discussion among Navajos any more than it has been among other societies until recently. Because of the sensitivity of the topic and the exploratory nature of the investigation, we believed that an open-ended approach was most appropriate and would provide more valid data than a standardized instrument.

Our respondents generally described physical abuse as a severe thrashing including, among other things, parental beating with fists, whipping with a belt or bailing wire, and twisting of ears or arms, but it also included being forced by parents or others to fight other children of the same age with the threat of a beating if the informant refused, being locked up, and being burned with cigarette butts. Sexual abuse was defined as inappropriate touching and fondling as well as actual physical penetration. The reported episodes ranged from fondling by an older relative or acquaintance to homosexual gang rape.

Other predictor variables are the following:
Type of community in which raised: rural reservation, reservation agency town, border town, or other off-reservation community, and any combination of places.
Number of households per camp. The preferred form of residence traditionally has been the matrilineal, matrilocal camp comprised of several related households. Currently many families live in single-household camps. The size of the camps is one measure of the extent to which informants were involved in a co-resident extended kin network as they were growing up. The data were collected for ages 0–6, 7–12, and 13 and above, corresponding to the ages at which children commonly enter school and attend primary and secondary school.
Migration and relocation were operationalized as residence in the same or different communities between age 0–6 and 7–12.
Social status. Before forced livestock reduction in the 1930s, social status was dependent on the *amount of livestock owned by a family*. This is counted in sheep units, which were determined by the Soil Conservation Service in the 1930s to be based on the amount of range each type of livestock required: 1 sheep or goat = 1 unit, 1 steer = 4 units, 1 horse = 5 units. Since the 1940s, sources of status have changed and are now dependent on *education* and *occupation*, and to a much lesser degree on livestock. Parents' education is measured as the number of years of schooling attained. Occupation is a categorical variable, which includes the most common forms of employment: traditional (animal husbandry, agriculture, weaving); white collar; skilled blue collar; unskilled blue collar; a combination of traditional and unskilled blue collar; a combination of traditional and skilled blue collar; any other combinations.

Religious affiliation is another measure of the degree to which informants were raised in traditional or acculturated families. The categories are: Traditional Navajo religion; Native American (Peyote) Church; established Protestant denomination; evangelical Protestant; Catholic; Church of Jesus Christ of the Latter Day Saints (Mormon); both Traditional and Native American Church; both Traditional and Christian; and none.
Family disruption was measured by the presence or absence of mothers and fathers separately at ages 0–6 and 7–12.
Drinking patterns of parents and other household members and frequent visitors when informants were growing up were classified as: abstainers; occasional; non-problem drinkers; problem drinkers; physically abusive problem drinkers. The informant need not have been the target of the abuse.

Statistical analysis

The effect of various risk factors on conduct disorder was studied with adjustment for 12 strata (3 community types × 2 age groups × 2 sexes). The dependent conduct disorder variable was logASYES, and the analyses were carried out by standard least-squares linear model methods, including analyses of variance and multiple comparisons (using the Bonferroni inequality) as follows.

Categorical risk factors

For categorical risk factors, the first step was a two-way ANOVA by the risk factor, the strata, and the risk-strata interaction. That interaction was not found to be significant in any of the analyses – as is illustrated in Table 1 but omitted from all other Tables. Hence, a two-way ANOVA without interaction was carried out, and, if the risk factor was found significant at 5%, say, the effects of individual levels were multiply compared by using significance level $5/k\%$, where k is the number of levels.

Quantitative risk factors

For quantitative risk factors, the same sequence was used, though the ANOVAs become multiple regressions. There is only one effect to be tested and that is expressed by the coefficient of partial regression onto the risk factor, given the strata (the latter are entered into the regression by means of dummy variables).

The ANOVA *F*-test 5% significance rule for looking at individual effects was relaxed in the case of one of the five analyses by drinking patterns, since the effects in the five analyses were very similar.

The results of these analyses are presented in Table 2. When the ANOVA *F*-test was clearly non-significant, there was no call to proceed to estimation and testing of the effects of individual risk levels or partial regression coefficients, so estimates and tests are not shown.

A few of the Tables have other dependent variables and/or one-way or three-way ANOVAs. They are presented analogously to the above.

Conduct of the interview:

Interviewing occurred between May 1993 and September 1995. Interviews ranged in length from 2 to 4 h. Interviewees were requested to sign a consent form that had been approved by both the University of Rochester's Institutional Review Board (IRB) and the IRB comprised of representatives of both the Navajo Tribe and the IHS. A Certificate of Confidentiality was obtained to protect informants should they report any illegal activities. At the end of the interview, each informant was paid $30.

The interviewers were one Navajo nurse; three non-Indian doctoral level anthropologists who had all carried out independent

field research on the Navajo Reservation; two non-Indian graduate students in anthropology, both of whom had also carried out independent research on the Navajo Reservation; and one medical doctor with a Ph.D. in sociology, who had carried out previous research on the Navajo Reservation. They were assisted by two Navajo field assistants/interpretors, although translation into Navajo was rarely necessary.

Results

Stratification variables

We have already pointed out that the controls who are analyzed in the present paper reflect the distribution by age, sex, and community of residence of the cases. The dependent variable, the conduct disorder score logAS-YES, differs significantly between the levels of each of the three variables (see Table 1). People aged 50 and above have lower scores than younger people. People from agency towns have higher scores than those from border towns, who in turn have higher scores than those from other reservation communities. And men have higher scores than women.

Type of community in which informant was raised

Earlier work suggested that being raised in an agency town is a risk factor for alcohol dependence (Kunitz and Levy 1994). Table 2 shows the results of a two-way ANOVA with type of community in which raised and the combined stratification variable as the two factors. There is a marginally significant ($P = 0.0637$) association between type of community in which raised and the conduct disorder score. People raised in rural communities tend to have the lowest scores.

Camp size

In a one-way ANOVA with number of households at ages 0–6 as the dependent variable and type of community in which raised as the independent variable, the largest camps were found in rural areas (see Table 3). People who grew up in agency and border towns lived in the smallest camps.

Table 2 displays an analysis of the association between logASYES and number of households per camp of residence before the age of 6. (Camp size at older ages does not differ significantly from those we have used.) There is a significant negative association between number of households per camp and logAS-YES: the more households, the lower the value of logASYES.

Migration

It has been suggested by some observers that, for Navajos, migration, whether forced (Schwarz 1997) as a result of a major land dispute with the neighboring Hopi Indians, or voluntarily for purposes of education (Griffen-Pierce 1997), causes considerable pyschological

Table 1A–C Analysis of log ASYES[a] by stratification factors (community type, age, and sex)

A ANOVA (3-way) with interaction

All 3 factors	d.f.	Sum of squares	Mean square	F-ratio	Prob($>F$)
Additive model	4				
Interactions	7	2.2487		0.9607	>0.5000
Error	722	241.4406	0.3344		

B ANOVA (3-way) without interaction

	d.f.	Sum of squares	Mean square	F-ratio	Prob ($>F$)
Community	2	4.6323		6.9289	0.0010
Age	1	17.8649		53.4431	<0.0001
Sex	1	7.8823		23.5799	<0.0001
Error	729	243.6893	0.3343		

C Effects (deviations from mean)

All 3 factors' effects[b]	Estimate	SE	t-ratio	Prob($>|t|$)
Rural reservation	−0.0733	0.0303	−2.42	0.0156
Reservation agency town	+0.1033	0.0322	+3.21	0.0014
Border town	−0.0298	0.0402	−0.74	0.4580
Age: >50	−0.2230	0.0305	−7.31	<0.0001
Sex: F	−0.1177	0.0242	−4.86	<0.0001

[a] ASYES is the total numbers of affirmative answers to the relevant series of questions in the DIS
[b] For dichotomous factors only one level is displayed

Table 2 Analysis of logASYES by stratification (community type, age, and sex) and various risk factors

Risk factor				
Community raised	P-value of F-ratio 0.0637			
Effects (deviations from mean)	Estimate	SE	t-ratio	Prob(> |t|)
Reservation rural	−0.0955	0.0415	−2.30	0.0218
Reservation agency town	+0.0873	0.0567	+1.54	0.1238
Off reservation	−0.0188	0.0826	+0.23	0.8197
Combinations	−0.0105	0.0424	−0.25	0.8019
No. of households	P-value of F-ratio 0.0031			
Partial regression coefficient	Estimate	SE	t-ratio	Prob(> |t|)
	−0.0422	0.0142	−2.97	0.0031
Same residence	P-value of F-ratio 0.0285			
Effects (deviations from mean)	Estimate	SE	t-ratio	Prob(> |t|)
Same residence	+0.0574	0.0261	+2.20	0.0285
Parents' livestock	P-value of F-ratio 0.0445			
Partial regression coefficient	Estimate	SE	t-ratio	Prob(> |t|)
	−0.000104	0.000052	−2.01	0.0445
Father's education	P-value of F-ratio 0.2931			
Partial regression coefficient	Estimate	SE	t-ratio	Prob(> |t|)
	+0.00483	0.00459	+1.05	0.2931
Mother's education	P-value of F-ratio 0.1182			
Partial regression coefficient	Estimate	SE	t-ratio	Prob(> |t|)
	+0.00713	0.00455	+1.56	0.1182
Parents' occupation	P-value of F-ratio 0.3857			
Informants' and parents' religion when growing up	P-value of F-ratio 0.1062			
Father's religion when informant was growing up	P-value of F-ratio 0.2444			
Mother's religion when informant was growing up	P-value of F-ratio 0.2534			
Presence of mothers in the home at age 0–6	P-value of F-ratio 0.8342			
Presence of mothers in the home at age 7–12	P-value of F-ratio 0.2776			
Presence of fathers in the home at age 0–6	P-value of F-ratio 0.0521			
Presence of fathers in the home at age 7–12	P-value of F-ratio 0.3919			
Father's drinking pattern	P-value of F-ratio 0.0161			
Effects (deviations from mean)	Estimate	SE	t-ratio	Prob(> |t|)
Abstainer	−0.0828	0.0425	−1.95	0.0515
Abuser	+0.1027	0.0367	+2.80	0.0053
Occasional	−0.0502	0.0390	−1.29	0.1986
Problem	+0.0304	0.0374	+0.81	0.4161
Mother's drinking pattern	P-value of F-ratio 0.0062			
Effects (deviations from mean)	Estimate	SE	t-ratio	Prob(> |t|)
Abstainer	−0.0834	0.0379	−2.20	0.0279
Abuser	+0.2583	0.0787	+3.28	0.0011
Occasional	−0.0375	0.0524	−0.72	0.4744
Problem	+0.1372	0.0543	+2.53	0.0017
Siblings' drinking pattern	P-value of F-ratio 0.0039			
Effects (deviations from mean)	Estimate	SE	t-ratio	Prob(> |t|)
Abstainer	−0.1220	0.0358	−3.41	0.0007
Abuser	+0.1140	0.0556	+2.05	0.0408
Occasional	+0.0209	0.0402	+0.52	0.6028
Problem	−0.0128	0.0510	−0.25	0.8009
Other camp members' drinking pattern	P-value of F-ratio 0.0841			
Effects (deviations from mean)	Estimate	SE	t-ratio	Prob(> |t|)
Abstainer	−0.0237	0.0412	−0.58	0.5650

Table 2 (contd.)

Risk factor				
Abuser	+0.0268	0.0531	+0.51	0.6135
Occasional	−0.0982	0.0489	−2.01	0.0453
Problem	+0.0951	0.0463	+2.06	0.0403
Visitors' drinking pattern	*P*-value of *F*-ratio 0.0002			
Effects (deviations from mean)	Estimate	SE	*t*-ratio	Prob($>|t|$)
Abstainer	−0.2618	0.0705	−3.71	0.0002
Abuser	+0.2140	0.0658	+3.25	0.0013
Occasional	−0.0573	0.0595	−0.96	0.3363
Problem	+0.1051	0.0497	+2.11	0.0352
Occurrence of physical abuse before age 15	*P*-value of *F*-ratio < 0.0001			
Effects (deviations from mean)	Estimate	SE	*t*-ratio	Prob($>|t|$)
	+0.1583	0.0319	+4.97	< 0.0001
Occurrence of sexual abuse before age 15	*P*-value of *F*-ratio < 0.0001			
Effects (deviations from mean)	Estimate	SE	*t*-ratio	Prob($>|t|$)
	+0.2090	0.0491	+4.26	< 0.0001

Table 3A, B Analysis of number of households per camp at ages 0–6 by community in which informant was raised

A ANOVA (one-way)

	d.f.	Sum of squares	Mean square	*F*-ratio	Prob($>F$)
Community raised	3	29.7806		6.8034	0.0002
Error	721	1077.4238	1.4591		

B Effects (deviations from mean)

Community raised	Estimate	SE	*t*-ratio	Prob($>|t|$)
Reservation rural	+0.3693	0.0821	+4.50	< 0.0001
Reservation agency town	−0.0505	0.1086	−0.47	0.6419
Off reservation	−0.4284	0.1670	−2.52	0.0119
Combinations	+0.1096	0.0862	+1.27	0.2042

distinct. Because we are concerned here only with conduct disorder before age 15, we have asked whether movement between ages 0–6 and 7–12 is associated with an increase in logASYES. The results are again displayed in Table 2 and indicate that logASYES is significantly higher when the community of residence was not the same throughout.

Social status

Low social class is associated with an increased risk of conduct disorder in other populations (Offord et al. 1986). In Table 2 we display the association between logASYES and several different measures of the status of families of origin. Livestock ownership is significantly and negatively associated with the conduct disorder score: the more livestock the parents owned, the lower was the score. There is no significant association with education of either mother or father. Similarly, a two-

way ANOVA which includes parental occupation as the antecedent is also not significant.

Religion

If social change exposes children to an increased risk of developing conduct disorder by disrupting established beliefs and relationships, then one would expect that people brought up in families that followed the traditional Navajo religion would have lower conduct disorder scores than other people. Moreover, some religions (i.e., the Native American Church, evangelical Protestants, and Mormons) are explicit in their condemnation of alcohol use. Since alcohol use by parents and other family members is associated with an increase in logASYES (see below), religions that take a stand against such behavior ought to be associated with lower logASYES scores among children of parents who are members of the church. The results of several analyses of religious background and logASYES are displayed in

Table 2. In none of them is there a significant association with logASYES.

Presence of parents and family drinking patterns

Family disruption is known from other studies to be associated with the development of conduct disorder. That does not appear to be the case among the people we interviewed, for there is no difference in the logAS-YES scores of men and women depending upon whether their mothers or fathers were present in the home. On the other hand, parental drinking, which has also frequently been observed to be associated with both conduct disorder and alcohol dependence in their offspring, is important in this population as well.

Detailed examination of the average logASYES scores within various categories showed that informants who were the sons and daughters of abstainers, and whose siblings, other household and camp members, and camp visitors were also abstainers, all had low ASYES scores. On the other hand, among informants whose parents and other family and household visitors were abusive problem drinkers, logASYES was higher than average.

The Experience of abuse

Table 2 also displays the results of two two-way ANOVAs with physical and sexual abuse as the antecedents and logASYES as the dependent variable. In each case abuse was significantly and positively associated with logASYES.

Finally, Table 4 displays the results of a multiple regression in which the risk factors found to be significant in the preceding analyses are included. Also included separately are the stratification variables community of present residence, sex, and age, instead of the combined stratification variable, because we wish to consider their independent effects. Interaction terms were also examined and not found significant.

The results indicate that mobility between ages 0–6 and 7–12, the type of community in which raised, present community of residence, parental livestock ownership, and fathers' drinking are no longer significant. Number of households per camp, sex, age, mothers' drinking, and both physical and sexual abuse remain significant.

Conclusions

The major limitations of this study are the result of the sampling design and the retrospective nature of the data. Because controls were sampled to reflect the age, sex, and community of residence of the cases, they do not reflect the distribution of the adult Navajo population on these same parameters. We have adjusted for the potential biases introduced by this sampling procedure

Table 4A, B Multiple regression of logASYES onto selected risk factors (0–6 & 7–12 community of residence the same at both ages, *Comm.Raised* type of comunity in which raised, *ComTyp* type of community in which currently residing, *FaDr* father's drinking pattern; *MoDr* mother's drinking pattern, *HH/Camp* number of households in the camp when informant was 0–6)

A Effect test

Source	No. parameters	d.f.	Sum of squares	F-ratio	Prob > F
0–6 & 7–12	1	1	0.0437365	0.1415	0.7069
Comm. Raised	3	3	1.0010886	1.0795	0.3571
Com Typ	2	2	0.8404658	1.3594	0.2575
Livestock	1	1	0.0089606	0.0290	0.8649
FaDr	3	3	2.3237594	2.5057	0.0581
HH/Camp	1	1	3.4935176	11.3012	0.0008
Sex	1	1	7.0438478	22.7862	< 0.0001
Age	1	1	9.3693333	30.3090	< 0.0001
Physical abuse < 15	1	1	3.6223211	11.7179	0.0007
Sexual abuse < 15	1	1	2.8679671	9.2776	0.0024
MoDr	3	3	3.0643200	3.3043	0.0199

B Parameter estimates [a]

Risk factors	Estimate	SE	t-ratio	P-value
HH/Camp	−0.061418	0.01827	−3.36	0.0008
Sex [f-m]	−0.126018	0.0264	−4.77	< 0.0001
Age	−0.012838	0.002332	−5.51	< 0.0001
Physical abuse yes = 1, no = 2	0.1192226	0.034828	3.42	0.0007
Sexual abuse yes = 1, no = 2	0.1557437	0.051132	3.05	0.0024
Mother's drinking				
Abstainer	−0.063	0.0546	−1.16	0.2465
Occasional	−0.006	0.0722	−0.084	0.9328
Problem	−0.215	0.0752	−2.862	0.0043
Abusive	0.2848	0.1105	2.576	0.0102

[a] Parameter estimates are included for only those risk factors with P-values < 0.05 in the effect test

by including community of residence, sex, and age in our analyses and then asking whether other risk factors also contribute to the level of conduct disorder score (measured as logASYES).

The retrospective nature of the data may cause biases of two different sorts: one resulting from difficulties in recalling events that occurred in childhood; the other from selective mortality of people with conduct disorder. With regard to recall, people with conduct disorder may have been more likely than others to minimize their childhood misbehavior. If this were the case, the effect would be to diminish the differences between those with and without conduct disorder. On the other hand, if recall were diminished regardless of conduct disorder, then the result would be to weaken equally the associations between the risk factors and conduct disorder. In either case, the results will be conservative; that is, risk factors may be declared insignificant when in fact they are significant.

In addition, if recall of childhood misbehavior is simply diminished with age, this may help account for the lower logASYES scores with increasing age. Moreover, selective mortality of people with conduct disorder is undoubtedly a very real phenomenon. It was the observation in our 25-year follow-up study of increased risk of death among a subset of young men that led to the present study, and this too would help account for the decrease in logASYES with increasing age.

Despite these confounding age-related effects, there is suggestive evidence of a true increase in conduct disorder as well. The decline of the livestock economy, the development of a cash economy, the great increase in school attendance, and the movement to agency and border towns with the accompanying diminution in camp size are post-World War II phenomena. In the past, multi-household camps were more common than they are today, and even single household camps were likely to be part of a cooperating kin network. Indeed, town camps are likely to consist of a nuclear family in a single household, occasionally with an additional friend or relative.

Inevitably in these settings there was much mixing of unrelated people in residential neighborhoods and schools and, as we have already noted, there was as well disruption of the network of obligations to kin which provided a context within which alcohol use was moderated by a sense of responsibility (Kunitz and Levy 1994). Instead, peer groups of unrelated young people drank together, unimpeded by the constraints of kinship obligations and responsible behavior. Indeed, since the early 1970s agency towns have seen the emergence of a youth culture and of youth gangs (Henderson et al., in press). Such social structural risk factors are similar to those found in other populations (Moffitt 1993).

The other risk factors in addition to age and camp size that remain significant in the multiple regression are physical and sexual abuse, maternal drinking patterns, and sex. Abusive maternal drinking is very rare and there is no evidence that it has increased over the period (before

the 1970s) during which most of our informants were growing up (Levy 1974). There is, however, evidence that drinking by women became more common in the 1980s than it had been previously (May and Smith 1988) and that fetal alcohol syndrome has increased in prevalence as a result. It is thus possible that if a study comparable to this one were to be done in another 10 or 20 years, an increase in abusive maternal drinking would be observed.

In the two-way ANOVAs, both abusive maternal and paternal drinking were significantly associated with an increase in logASYES, whereas in the multiple regression only maternal drinking was. This is probably because abusive paternal drinking is widespread, but generally mothers do not drink abusively and thus represent a source of domestic stability. When mothers drink abusively, it is almost always along with an abusively drinking partner, thus depriving the child of an important source of stability.

Physical abuse and corporal punishment have been shown to be followed by increased aggression among children (Straus et al. 1997), and the results presented here are consistent with those findings. On the other hand, while sexual abuse in childhood is associated with a variety of subsequent psychological problems, in studies of clinical populations aggression and anti-social behavior are not prominent among them. In studies of nonclinical populations, however, such behavior is more common among sexually abused than non-abused children (e.g., Kendall-Tackett et al. 1993). The results of the present study, then, are consistent with those from other populations.

In one respect the results of the present study are at variance with results observed elsewhere, for contrary to other studies (Offord et al. 1986) there is virtually no association with between any measure of social status of family of origin and the conduct disorder score. The only measure that was significant – amount of livestock owned by the parents – became insignificant in the multiple regression. The likely explanation is the one suggested by Offord et al. (1986), that it is not social status *per se* but what they call the "under-the-roof culture" of the household that is important. Thus, abuse and parental – especially maternal – drinking in this population may bear no relationship to social status.

Finally, while the same risk factors are important for women as well as men, women have a substantially lower prevalence of conduct disorder. As noted at the outset, there has been debate about the meaning of this same gender difference in other populations: whether it has to do with innate differences between males and females, or whether the criteria relevant to males are simply not relevant to females. Our data do not speak to these issues, and we can only say that women appear to be less responsive to the risk factors that affect men.

Thus, several of the risk factors associated with conduct disorder in other populations are also important among Navajo Indians. Moreover, there is suggestive evidence that some important risk factors may have increased in prevalence in recent decades. If so, there

may have been an associated increase in conduct disorder itself. If true, this too may be something that Navajos share with other populations.

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