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## Tattooing and high-risk behavior in adolescents

Pediatrics, Dec. 2002 by Timothy A. Roberts, Sheryl A. Ryan

ABBREVIATION. SD, standard deviation

Tattooing is a common behavior in Western society. Ten percent to 16% of adolescents age 12 to 18 and 3% to 9% percent of the general population report having permanent tattoos. (1-4) Despite the frequency of tattooing in adolescents, few studies have looked specifically at this behavior.

The majority of studies on tattooing have focused on the medical complications of having a tattoo applied. The behavioral surveys currently in the literature are in highly selected samples of adolescents and demonstrate inconsistent associations with risk behavior. For example, populations studied to date have been from detention centers, alternative schools, clinic populations, and colleges. These studies have demonstrated a high incidence of sexual risk behavior, violent behavior, substance use, and criminality among those with tattoos (5-9) However, other studies done in high school students and military recruits have not found these associations. (1,2,10) These inconsistent results have made the clinical significance of tattoos in adolescents difficult to determine

In view of the contradictory evidence available on this subject and the increasing frequency of tattooing among youths, this study sought to clarify the clinical significance of tattooing in adolescents. This study examined a large, nationally representative sample of adolescents to answer 3 questions: 1) what is the prevalence of tattooing in adolescents? 2) what are the associations between tattooing and key demographic variables in adolescents? 3) Are tattooing and high-risk behaviors associated with each other in adolescents?

### METHODS

#### Source of Data

This study is a secondary analysis of the National Longitudinal Study of Adolescent Health (Add Health). Add Health is a survey that provides a nationally representative sample of adolescents 11 to 21 years of age. For this survey, adolescents initially were randomly selected from a representative sample of junior and senior high schools and invited to complete 2 waves of in-home surveys approximately 1 year apart in 1995 and 1996. The schools were stratified by size, ethnic composition, region, and neighborhood type. Individual adolescents were stratified by gender and grade. Other groups were intentionally oversampled during the survey process to supplement the nationally representative core sample group. A total of 12 118 adolescents completed the first wave of the in-home survey.

For this study, we used the Add Health public use data set. Although this data set contains 50% of the nationally representative core sample group and 50% of the oversampled group of black adolescents with college-educated parents, only the

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sample size of 6072. Data from wave 1 of the Add Health survey, collected in 1995, were used for analysis, except as noted.

Respondents in 12th grade at wave 1 were not interviewed in wave 2 ( $n = 960$ ). An additional 517 respondents did not complete wave 2 of the survey, leaving a final population of 4595 adolescents for analyses involving wave 2 data. After excluding the adolescents who were in 12th grade at wave 1, the adolescents who completed wave 1 but did not complete wave 2 of the survey were significantly more likely to be male ( $P < .001$ ).

On both waves 1 and 2 of the survey, adolescents were asked to rate how honest they had been while answering the survey using a 4-point scale ranging from "not at all honestly" to "completely honestly." Respondents who reported being "not at all honest" while responding to the survey were excluded from the current study (2.8% of the sample). This group was significantly more likely to be male ( $P < .001$ ), be black ( $P < .005$ ), have lower parental education ( $P < .001$ ), have lower household income ( $P < .05$ ), and live in a single-parent household ( $P < .05$ ). The demographic characteristics of the sample population studied, after excluding those who reported being "not at all honest," are listed in Table 1.

#### Predictor Variables

The major predictor variable used was the report of the possession of a permanent tattoo. On wave 1 and 2, adolescents who were taking the survey were asked, "Do you have a permanent tattoo? Yes/No." A number of sociodemographic factors were also used as predictor variables, including gender, age (categorized as 11-13 years of age, 14-16 years of age, and 17-21 years of age to correspond to early, middle, and late adolescence), ethnicity (white non-Hispanic, black non-Hispanic, Hispanic, and other), neighborhood type (rural, suburban, and urban), number of parents living in the home (1 or  $\geq 1$ ), highest level of parental education reported by either parent (less than high school, high school, education beyond high school, and college education or more), and family income (divided into quartiles based on median family income from 1989 census tract data).

Finally, peer substance use was used as a predictor variable. Peer substance use was measured using a 10-point scale created from 3 questions about daily smoking, monthly drinking, and monthly marijuana use in the subject's 3 best friends (scale [ $\alpha$ ] = 0.76).

#### Outcome Variables

Several self-reported high-risk behaviors were used as the primary outcome variables. These outcome variables were selected from 4 major areas of high-risk behavior involvement: sexual involvement, substance use, violent behavior, and school problems. Sexual involvement was measured with a single item that measured whether the adolescent had ever had sexual intercourse. Substance use was evaluated using 3 separate items that measured any smoking during the last month, any marijuana use

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tested for any report of involvement in a serious physical fight during the last year, inflicting serious injuries (injuries requiring medical treatment) in the last year, and joining a named gang during the last year. School problems were measured using 2 items that tested for any episode of truancy during the last year and school failure (grade of D or less in English, math, science, or history on the last report card). All variables were scored dichotomously as involvement versus no involvement.

#### Analyses

Descriptive analyses were used to determine the prevalence of tattooing in the sample and the incidence of new tattoo acquisition between waves 1 and 2. To adjust for the large weighted sample size, Add Health sample weights were normalized and recalculated so that the weighted *n* for a particular sample was equal to the sample size. Bivariate associations between demographic variables and responses to the honesty question, reported tattooing, and outcome risk behaviors as well as the association between tattooing and risk behavior were examined using [chi square] analyses. The relationship between tattooing and peer substance use was examined using an independent sample *t* test to compare the mean peer substance use score.

To determine the independent association between tattooing and risk behaviors, controlling for sociodemographic variables and peer substance use, we developed logistic regression models. All of the demographic variables that were significantly associated at a level of  $P > .05$  with any of the risk behaviors were retained in the final models. Before development of the final models, each of the components was tested for multiple colinearity; no correlations high enough to present problems with multicollinearity were found. The model was tested against each of the risk behaviors at wave 1, except for gang membership, which was asked only on wave 2. For gang membership, a separate logistic regression model was developed using wave 2 data following the procedure outlined above. The descriptive analyses, [chi square] analyses, independent sample *t* test, and logistic regressions were performed using SUDAAN (11) to account for the clustered sampling design of the Add Health survey. Because of the large sample size and the large number of associations examined, the level of significance for all tests was set at  $P < .01$ .

#### RESULTS

##### Prevalence of Tattooing

Permanent tattoos were reported by 270 (4.6%) of the 5837 adolescents in wave 1. Between waves 1 and 2 of the survey, approximately 1 year later, 131 (3.0%) of the 4379 adolescents in wave 2 reported acquiring a tattoo for the first time. The average age of tattoo acquisition between waves 1 and 2 was 16.8 years (standard deviation [SD], 1.4).

##### Demographic Correlates of Tattooing

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Older adolescents were significantly more likely to be tattooed (0.5% in the youngest adolescents and 7.6% in the oldest adolescents;  $P < .001$ ). Adolescents from single-parent households were twice as likely to be tattooed (6.4% vs 3.2%,  $P < .001$ ). Adolescents whose families were in the lowest income quartile were significantly more likely to be tattooed (6.8%;  $P < .001$ ), and adolescents with families in the highest income quartile were significantly less likely to be tattooed (3.2%;  $P < .005$ ). The prevalence of tattooing also varied significantly with the level of parental educational attainment. Adolescents whose parent had a high school education or less were more likely to be tattooed (7.0% and 5.7%;  $P < .01$ ), and adolescents whose parent had a college education or more were less likely to be tattooed (2.4%;  $P < .001$ ). Gender, ethnicity, and the neighborhood type were not significantly associated with tattooing (Table 2).

Tattooing was also significantly associated with higher levels of peer substance use. Nontattooed adolescents reported an average peer substance use score (on a scale of 0-9) of 2.4 (SD = 2.6), whereas tattooed adolescents reported an average score of 5.1 (SD = 2.8;  $P < .001$ ). In our sample, 34.6% of nontattooed versus 55.5% of tattooed adolescents reported that none of their 3 best friends was a daily smoker or had used alcohol or marijuana in the last month. Conversely, 3.5% of nontattooed and 11.6% of tattooed adolescents reported that all 3 of their 3 best friends were daily smokers and had used alcohol and marijuana in the last month (data not shown).

### Tattooing and Risk Behaviors

In bivariate analysis (Table 3), significant associations were found between tattooing and all of the high-risk behaviors that we examined ( $P < .001$  for all associations). For example, in the area of sexual activity, 83% of tattooed adolescents reported a history of sexual intercourse compared with 36% of nontattooed adolescents. In the area of substance use, 63% of tattooed and 26% of nontattooed adolescents reported smoking in the last 30 days. Fifty-four percent of tattooed adolescents and only 32% of nontattooed adolescents reported involvement in a serious physical fight during the last year. Finally, in the area of school problems, 60% of tattooed adolescents reported a history of school truancy compared with only 26% of nontattooed adolescents.

In logistic regression analyses adjusting for socio-demographic variables and peer substance use, tattooed adolescents were significantly more likely to report high rates of involvement in all of the risk behaviors examined (Table 4). Sexual intercourse and gang membership had the strongest relationships with tattooing. Tattooed adolescents were 4 times more likely to have ever had sexual intercourse and almost 3 times more likely to have been initiated into a named gang in the last year compared with adolescents without tattoos. Smaller associations were found with marijuana use in the last month, being involved in a serious physical fight in the last year, and having a grade of D or less on the last report card. For these behaviors, tattooed adolescents were almost twice as likely as nontattooed adolescents to report involvement.

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## DISCUSSION

This study demonstrates that tattooing is a common behavior among adolescents and is strongly related to a wide variety of behaviors that put adolescents at risk for morbidity and mortality. Tattooed adolescents report greater involvement in sexual intercourse, higher levels of substance use by their peers and by themselves, significantly higher levels of violence perpetration, and more frequent school problems than their nontattooed peers.

Previous studies that examined the associations between tattooing and adolescent risk behavior have been done in smaller biased samples and have demonstrated mixed associations between tattooing and a variety of risk behaviors. (1,2,5-10) This is the first study to use a large, nationally representative sample of adolescents to examine the association between tattooing and high-risk behavior in adolescents. This work provides a more generalizable picture of the prevalence of tattooing and the behavioral context of tattooing in adolescents than previous work in this area.

Behaviors related to sexuality, substance use, violence, and school failure during adolescence are widely known to have significant immediate consequences as well as repercussions that continue long into adulthood. (12) Identifying adolescents who are at risk for these behaviors, because of their environment, peer group, or other factors, and preventing the consequences of these behaviors are the focus of preventive efforts in the clinical care of adolescents. (13) Given the strong links between tattooing and high-risk behavior found in this study, tattooing in an adolescent can serve as a useful, easily visible, clinical marker that may identify adolescents who are at a higher risk for engaging in risk behavior.

Several limitations to this study must be noted. First, this survey was school based and surveyed only those adolescents who were enrolled in school at the beginning of the recruitment process. Because many of the risk behaviors studied are associated with school difficulty and dropping out of school, this survey may underestimate the level of risk behaviors present in the general adolescent population. Second, this study uses self-reported data, and it is unknown how reliable adolescent reports of tattoo possession and risk behavior involvement are in the survey used here. This issue was addressed during the data collection by the use of a self-administered computer-assisted survey technique for the sensitive areas of the survey, a method that has been shown to maximize confidentiality of these responses and disclosure of sensitive information. (14) This study also made use of the self-reported "Honesty question" provided on the survey to exclude adolescents who reported dishonesty when answering the survey. Third, the data for this study were collected in 1995 and may not reflect the current prevalence or behavioral context of tattooing in adolescents. In our study, 4.5% of adolescents reported having tattoos, which is lower than the rate reported in studies done concurrently (1,2) and much lower than more recent studies. (3,8,9) The difference in the frequency of tattooing found in our study and other studies of tattooing in adolescents done during the same time period may reflect differences in the way the data were collected. Previous studies on tattooing in adolescents in the mid-1990s were conducted in convenience samples, (1,2) which may be biased toward

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and behavioral associations of tattooing among adolescents at the time these data were collected in 1995. In more recent studies, the frequency of tattooing among adolescents is much higher than was found in our study (3,8,9). This probably reflects a combination of data collection methods and an actual increase in the frequency of tattooing among adolescents. This raises the concern that as tattooing has become more common, the associations with risk behavior may have become less strong. However, another study of risk behavior and tattooing among adolescents by Carroll et al. (9) completed in 2001, reported a much higher rate of tattooing (13.1%) but had similar strong associations among tattooing, substance use, and sexual behavior. Finally, this study examined only the presence or absence of tattooing and did not examine the details of the individual tattoo, such as how the tattoo was obtained, whether the adolescent had parental consent before obtaining the tattoo, tattoo meaning, age the tattoo was obtained, or the location of the tattoo. Of particular concern is the lack of information about how the tattoo was applied because several studies have suggested a higher rate of risk behavior associated with amateur tattooing as compared with professionally applied tattoos. (2,7,9) Despite these limitations, however, the representative sample of adolescents used in this study adds significantly to previously published studies in this area and provides a more generalizable picture of the prevalence of tattooing and the behavioral context of tattooing in adolescents.

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It is important to note that this research was done in a junior and senior high school-age population and reflects the behavioral context of tattooing in this group only and does not generalize to tattooing in other age groups. Also, although it may be tempting to conclude that all tattooed adolescents engage in high-risk behavior, our data serve only to support the higher likelihood of tattooed adolescents being involved in such behaviors. Clearly, the observation of a tattoo is no substitute for skillful clinical interviewing done in a supportive and nonjudgmental manner. Observation of a tattoo should be used in the same way that observation of clothing, hair, demeanor, and other aspects of appearance can be used to supplement the clinical interview. Each of these aspects of appearance is primarily under an adolescent's control and reflects the image that he or she is projecting to the world. Observing and seeking to understand the image that an adolescent is projecting may provide important clues as to how an adolescent views his or her role in the world and can be valuable in tailoring a clinical encounter to best serve the adolescent's health needs, particularly as they relate to counseling about behavior.

### Future Directions

Additional research into the relationship between risk behaviors and the details of the tattoo, such as age of first tattoo, amateur tattooing, meaning of the tattoo, and the presence of other types of body modification such as body piercing, should provide useful details in the clinical setting and is an important area for additional investigation. Also, additional research is needed to identify the mechanisms responsible for the links between possession of a tattoo in an adolescent and increased risk behavior. In our study, we hypothesized that sociodemographic factors or peer affiliation would mediate the relationship between tattooing and high-risk behavior, however, even after adjusting for these factors, tattooing still had strong independent associations with all of the risk behaviors that we examined. One potential mechanism would be lower levels of parental monitoring and poor communication with parents. This is suggested by previous studies that found that the majority of adolescents who have tattoos did not get parental permission or discuss getting a tattoo with their parents before they acquired the tattoo. (1-3) In 2 of these studies, 40% to 60% of the tattooed adolescents reported that their parents still were unaware of the tattoo. (1,2) Given the strong association between low parental monitoring and risk behavior, this could be a strong potential mediating factor. (15)

### CONCLUSION

Tattooing is a common behavior among adolescents and has strong associations with early sexual intercourse, substance use, interpersonal violence, and school failure. These risk behaviors account for the majority of the morbidity and mortality seen in adolescents. Tattooing may serve as a permanent, easily detectable, visual marker for an adolescent who is at risk for involvement in premature sexual intercourse, substance

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examination of an adolescent should prompt a more intensive assessment for high-risk behaviors and subsequent counseling during clinical office visits

TABLE 1 Demographics of the Sample Population

Sociodemographic Group	N (Weighted %)
Gender (n = 5827)	
Male	2776 (50)
Female	3051 (50)
Ethnicity (n = 5832)	
White	3743 (70)
Black	1069 (14)
Hispanic	697 (12)
Other	323 (5)
Age (n = 5837)	
11-12 y	489 (5)
14-16 y	2723 (45)
17-21 y	2565 (41)
Neighborhood type (n = 5726)	
Rural	1659 (27)
Suburban	2138 (35)
Urban	1929 (34)
Family composition (n = 5723)	
1 parent	1771 (30)
2 or more parents	3952 (70)
Highest level of parental education (n = 5519)	
Less than a high school diploma	614 (11)
High school diploma	1742 (33)
Some college	1155 (21)
College graduate or higher	2006 (35)

TABLE 2. Prevalence of Tattooing, by Demographic Variables

Demographic Variable	Proportion of Adolescents in Each Group with Tattoos (Weighted %)
Gender	
Male	127/2776 (4.8%)
Female	133/3051 (4.2%)
Ethnicity	
White	152/3743 (4.1%)
Black	43/1069 (4.4%)
Hispanic	51/697 (6.6%)
Other	16/323 (5.1%)
Age	

#### RELATED TE

- Tattooing, aspects
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17-21 y	1255/2505 (7.6%)
Number of parents in household	
2 or more parents	131/1952 (3.2%) *
1 parent	116/1771 (6.4%)
Family income by quartiles	
Lowest quartile	90/1423 (6.8%) *
Second quartile	60/1373 (4.4%)
Third quartile	57/1381 (4.0%)
Fourth quartile	63/1660 (3.2%)
Highest level of parental education	
Less than a high school diploma	44/614 (7.0%) *
High school diploma	104/1744 (5.7%)
Some college	42/1155 (3.3%)
College graduate or higher	20/2006 (2.4%)
Neighborhood type	
Rural	69/1659 (4.1%)
Suburban	89/2138 (3.9%)
Urban	101/1929 (5.2%)

\*  $P < .001$

TABLE 3. Bivariate Analyses: Association of Tattooing With Risk Behaviors

Risk Behavior	Proportion of Tattooed Adolescents Engaging in the Risk Behavior (Weighted %)	Proportion of Nontattooed Adolescents Engaging in the Risk Behavior (Weighted %)
Sexual intercourse *	224/268 (83.4)	2042/5521 (35.8)
Substance use		
Binge drinking *	208/267 (78.4)	2542/5555 (45.5)
Smoking *	168/268 (63.3)	1379/5535 (25.5)
Marijuana use *	104/261 (37.6)	644/5495 (12.2)
Violent behavior		
Fighting *	139/269 (53.6)	1731/5561 (31.9)
Inflicted injuries *	96/269 (37.6)	945/5555 (17.4)
Joined gang *	34/265 (13.9)	147/4077 (3.7)
School problems		
Truancy *	148/247 (60.2)	1451/5466 (25.1)
School failure *	125/240 (51.6)	1502/5317 (26.8)

\*  $P < .001$ .

TABLE 4. Logistic Regression: Independent Association of Tattooing With Risk Behaviors

Risk Behavior

Non-tattooed  
(OR (95% CI))

Sexual intercourse	4.0 (2.6-6.2) ([double dagger])
Substance use	
Smoking	2.3 (1.5-3.5) ([double dagger])
Marijuana use	1.7 (1.2-2.5) "
Binge drinking	1.9 (1.2-2.9) "
Violent behavior	
Fighting	1.7 (1.3-2.4) ([dagger])
Inflicted injuries	2.1 (1.5-3.0) ([dagger])
Joined gang	2.8 (1.7-4.6) ([double dagger])
School problems	
Truancy	2.1 (1.5-3.0) ([double dagger])
Failing school	1.7 (1.2-2.4) ([dagger])

OR indicates odds ratio, CI, confidence interval.

" P < .01.

([dagger]) P < .005.

([double dagger]) P < .001.

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