
Tattoos and body piercings in the United States: A national data set

Anne E. Laumann, MBChB, MRCP(UK),* and Amy J. Derick, MD
Chicago, Illinois

See commentary on page 422

Background: Little is known about the prevalence and consequences of body art application.

Objective: Our aim was to provide US tattooing and body piercing prevalence, societal distribution, and medical and social consequence data.

Methods: Random digit dialing technology was used to obtain a national probability sample of 253 women and 247 men who were 18 to 50 years of age.

Results: Of our respondents, 24% had tattoos and 14% had body piercings. Tattooing was equally common in both sexes, but body piercing was more common among women. Other associations were a lack of religious affiliation, extended jail time, previous drinking, and recreational drug use. Local medical complications, including broken teeth, were present in one third of those with body piercings. The prevalence of jewelry allergy increased with the number of piercings. Of those with tattoos, 17% were considering removal but none had had a tattoo removed.

Limitations: This was a self-reported data set with a 33% response rate.

Conclusion: Tattooing and body piercing are associated with risk-taking activities. Body piercing has a high incidence of medical complications. (J Am Acad Dermatol 2006;55:413-21.)

There has been an increase in the placement of body art involving puncturing of the skin in recent years. In the past more men than women sported tattoos,¹ and body piercings were mainly in the soft part of the ear lobes of women. During the 1940s military personnel often had tattoos with patriotic designs, together with hearts and the names of loved ones. With the advent of peace, the popularity of tattoos decreased, although they were still seen in close-knit group situations. They

became associated with marginalized groups, signaling time spent in jail, "punk" status, membership in a motorcycle gang, or a traveling circus. In more recent times, images have become increasingly eclectic and the practice has become mainstream. Body piercing has been practiced in almost every society and has usually been confined to the ears, mouth, and nose. It is often related to ritual ceremonies and religious rites.² In North America soft ear lobe piercing for the secure insertion of earrings was already commonplace in the early 1970s.³ Recently, piercing of other parts of the body has become popular. Little is known about the current prevalence, societal distribution, and the medical and social consequences of these activities.⁴ This study is an attempt to quantify some of these issues.

From the Section of Dermatology, University of Chicago.

*Current affiliation: Department of Dermatology, Northwestern University; data collected while in the Section of Dermatology, University of Chicago; analysis started while at the University of Chicago and continued while at Northwestern University.

Supported by the Portes Center administered through the Institute of Medicine of Chicago and the Sage Foundation.

Conflicts of interest: None identified.

Accepted for publication March 15, 2006.

Reprint requests: Dr Anne Laumann, 676 N St Clair Street, Suite 1600, Chicago, IL 60611. E-mail: a-laumann@northwestern.edu.

Published online June 19, 2006.

0190-9622/\$32.00

© 2006 by the American Academy of Dermatology, Inc.

doi:10.1016/j.jaad.2006.03.026

METHODS

After a series of pretests, trained interviewers from the Public Opinion Laboratory at Northern Illinois University administered a telephone survey to 500 respondents aged 18 to 50 years between February 11 and April 18, 2004.

**Table I.** Distribution and associations of tattoos and body piercings

	Total (No.)* 100% (500)	Has a tattoo 24% (120)	Has ever had a body piercing 14% (72)	Has had any body art 30% (151)	Has had both tattoo and body piercing 8% (41)
Gender					
Women	51% (253)	22% (56)	21% (52) [†]	33% (83)	10% (25)
Men	49% (247)	26% (64)	8% (20) [†]	28% (68)	7% (16)
Ethnicity					
Black/African American	12% (57)	28% (16)	7% (4)	33% (19)	2% (1)
White/Caucasian	79% (392)	22% (86)	14% (54)	28% (109)	8% (31)
Other	10% (47)	36% (17)	30% (14) [‡]	47% (22) [‡]	19% (9)
Hispanic ancestry					
Hispanic	9% (45)	38% (17) [†]	27% (12) [†]	47% (21) [†]	18% (8)
Non-Hispanic	91% (445)	23% (102) [†]	13% (59) [†]	29% (128) [†]	7% (33)
Marital status					
Married/engaged	51% (258)	20% (52)	11% (29)	25% (64)	7% (17)
Living with a partner	6% (29)	41% (12)	17% (5)	48% (14)	10% (3)
Divorced/separated	12% (60)	27% (16)	12% (7)	30% (18)	8% (5)
Widowed	1% (6)	50% (3)	0	50% (3)	0
Never married	27% (140)	25% (35)	22% (31)	36% (50)	11% (16)
Income					
<\$40K	32% (161)	32%(52) [†]	21% (33)	39% (63)	14% (22)
\$40K-\$75K	25% (124)	24% (30) [†]	14% (17)	30% (37)	8% (10)
>\$75K	23% (116)	19% (22) [†]	14% (16)	28% (32)	5% (6)
Religion[§]					
Religious affiliation:	64% (320)	19% (61) [†]	11% (35) [†]	25% (79) [†]	5% (17) [†]
No religious affiliation	34% (169)	33% (55) [†]	20% (34) [†]	40% (67) [†]	13% (22) [†]
Year of birth					
1953-1963	36% (180)	15% (27) [†]	2% (4) [†]	15% (27) [†]	2% (4)
1964-1974	34% (170)	24% (41) [†]	13% (22) [†]	32% (54) [†]	5% (9)
1975-1986	28% (140)	36% (50) [†]	32% (45) [†]	48% (67) [†]	20% (28) [‡]
Politics					
Republican	31% (153)	22% (33)	8% (12)	25% (39)	4% (6)
Democrat	28% (141)	24% (34)	16% (22)	31% (44)	9% (12)
Independent	20% (102)	27% (27)	19% (19)	35%(36)	10% (10)
Other	14% (63)	29% (18)	18% (11)	33% (21)	13% (8)
Military					
Military experience	10% (49)	37%(18) [†]	12% (6)	37% (18)	12% (6)
No military experience	89% (447)	23% (103) [†]	15% (66)	30% (133)	8% (35)
Jail time					
≥ 3 days or more	10% (50)	58% (29) [†]	26% (13) [†]	62% (31) [†]	22% (11) [†]
<3 days	90% (442)	20% (90) [†]	13% (58) [†]	27% (118) [†]	7% (30) [†]
Alcohol consumption					
Never drank	27% (133)	14% (19) [†]	6% (8) [†]	17% (23) [†]	3% (4) [†]
Currently drink	60% (295)	26% (77) [†]	17% (51) [†]	34% (99) [†]	10% (29) [†]
Used to drink [¶]	13% (63)	37% (23) [†]	19% (12) [†]	43% (27) [†]	13% (8) [†]
Ever used recreational drugs					
Yes	31% (148)	38% (56) [†]	22% (32) [†]	45% (67) [†]	14% (21) [†]
No	69% (330)	18% (59) [†]	12% (39) [†]	24% (78) [†]	6% (20) [†]

Table I. Cont'd

	Total (No.)* 100% (500)	Has a tattoo 24% (120)	Has ever had a body piercing 14% (72)	Has had any body art 30% (151)	Has had both tattoo and body piercing 8% (41)
Education (respondents aged ≥ 24 y)					
Total (No.)	100% (427)	23% (97)	12% (52)	28% (118)	7% (31)
Did not complete high school	10% (43)	40% (17) [†]	19% (8)	42% (18) [†]	16% (7)
Completed high school	20% (85)	29% (25) [†]	17% (14)	33% (85) [†]	13% (11)
Some college	30% (126)	25% (31) [†]	12% (15)	29% (36) [†]	8% (10)
Bachelors' degree	26% (111)	14% (16) [†]	8% (9)	23% (25) [†]	0
Graduate school	15% (62)	14% (8) [†]	10% (6)	18% (11) [†]	5% (3)

Numbers in parentheses are numbers of respondents within each variable.

*Values in column 1 represent percentages of total for each group. Numbers may not add up to 100% in each group because of rounding and occasional absent responses. Each percentage in columns 2, 3, 4, and 5 is the percentage for that variable of the total for the characteristic in column 1.

[†]P <.05 between all adjacent cells within the same group.

[‡]P <.05 related to the immediately superior cells in the same group, but the two cells above are not significantly different from each other.

[§]The question was "Regardless of whether you now attend any religious services do you think of yourself as part of a particular denomination?"

^{||}This is a combination of two questions: "Have you ever been or are you currently on active duty in the military, and are you a member of the military reserve or National Guard?"

[¶]If the respondent denied drinking alcohol, the next question was: "Have you ever been a drinker?"

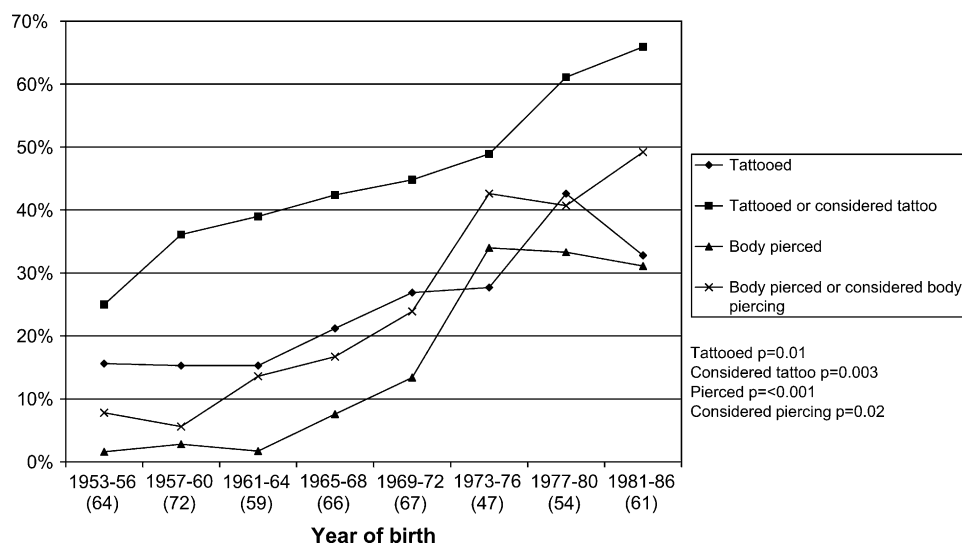


Fig 1. Percentage of respondents tattooed or body pierced according to year of birth.

The respondents were selected using random digit dialing (RDD) to obtain a national probability sample within the 48 contiguous United States with approximately equal numbers of men and women. RDD allows for very wide coverage of an area, as it includes numbers for households that have recently moved, and for residents with unpublished numbers. Out of the initial bank of telephone numbers, 6416 were available for random drawing. Calling attempts were made on different days and at different times to try to reach respondents who had as many different attitudes, habits, and characteristics as possible. Calls on weekdays were often made after

4:30 PM and late into the evening in order to reach respondents in the western time zones.

Nineteen thousand three hundred thirteen (19,313) calls were made to complete 500 ($N_{complete}$) interviews. Eighteen hundred sixty-one numbers did not turn into completed interviews for the following reasons: business numbers (217), nonworking numbers (663); fax/modem pager (298), group home (3), no respondent meeting eligibility (554), language barrier (99), physical/mental impairment (11), unavailable during period of interviewing (16). Sixteen hundred thirty-two (1632) ($N_{refusals}$) numbers were labeled as refusals as follows: absolute refusal (761),

Table IIA. Position and size of tattoos

	Tattoo site and size		
	Male (n = 64)	Female (n = 56)	P value
Face	0 (0)*	2 (4)	NS
Neck	5 (8)	2 (4)	NS
Chest	11 (17)	11 (20)	NS
Arms	48 (75)	4 (7)	<.001
Hands, fingers	9 (14)	1 (2)	NS
Abdomen	3 (5)	7 (13)	NS
Upper back, shoulder	22 (34)	14 (25)	NS
Lower back	3 (5)	10 (18)	.03
Buttocks	2 (3)	3 (5)	NS
Hips	1 (2)	5 (9)	NS
Legs	13 (20)	8 (14)	NS
Ankle	1 (2)	15 (27)	<.001
Feet, toes	1 (2)	2 (4)	NS
At least one exposed [†]	57 (89)	27 (48)	<.001
Only covered tattoos	7 (11)	29 (52)	<.001
Size is a palm or less	35 (56)	45 (80)	.003
More than a palm	28 (44)	11 (20)	.003

NS, Not statistically significant.

*Number (%) in category.

[†]Exposed tattoos are on the face, neck, arms, hands, fingers, legs, ankles, feet, and toes. These percentages did not vary by race.

multiple attempts to reach respondent (52), multiple attempts at the household (578), multiple attempts—busy (16), answering machine at known residence (27), respondent claimed to have already completed survey (14), pending appointment at end of survey calling time (168), invalid/partial completes (16). It was unknown whether 524 (*N_{unknown}*) numbers belonged to a residence as follows: technical barrier (15); multiple attempts made, number never answered (340); answering machine (169). A number was considered “dead” if after 8 attempts it did not turn into a refusal, complete or unqualified number. Respondents who initially refused to participate were called back; 68 cases (14% of 500) became completed interviews on callback.

The introduction of the survey follows: “Hello, my name is _____ and I’m calling from the Public Opinion Laboratory on behalf of physicians at the University of Chicago. We are doing a national health study and I would like to ask you a few questions.” So, the refusals were not related to the body art content of the questionnaire.

The calculated response rate (*RR3*) was 33%.⁵ This was derived as follows:

$$RR3 = \frac{N_{complete}}{N_{complete} + e(N_{refusals} + N_{unknown})}$$

where *e* (=48%) is the estimated proportion of cases of unknown eligibility that are eligible. This was estimated by using 2000 census data.

Table IIB. Position of piercings: Total piercings by site, respondents with soft ear lobe piercings, and respondents with body piercings

	Male	Female	P value
Total piercings by site*			
Part of jewelry in mouth	21	19	
Ear (not soft ear lobe)	28	66	
Nose	5	13	
Belly button	3	29	
Eyebrow	9	5	
Nipple	6	1	
Genitals	5	2	
Soft ear lobe stretched	3	0	
No. of respondents with soft earlobe piercings [†]			
At least one soft earlobe	47 (19)	124 (49)	<.001
Soft earlobes only	28 (11)	76 (30)	<.001
Respondents with BPs [‡]			
Had had >1 BP	14 (70)	26 (50)	NS
At least one visible BP [§]	19 (95)	40 (77)	NS
Covered BP only	1 (5)	12 (23)	NS

BP, Body piercing; NS, not statistically significant.

*All piercings in a given location, including ones that have closed and been repierced.

[†]Male respondents (n = 247); female respondents (n = 253); number in parentheses is percentage.

[‡]Male respondents (n = 20); female respondents (n = 52).

[§]Visible BPs include those in the hard cartilage of the ear, nose, eyebrow, face, lip, or tongue.

The average duration of the interviews was 11 minutes. If the respondent had no tattoos or body piercings it was 8 minutes and if the respondent had both it was 24 minutes.

The survey has a 4.4% margin of error. The statistical analyses were performed using SPSS for Windows, version 13.0 (SPSS, Chicago, Ill). Proportions were compared using the two-tailed chi-square test. Fisher’s exact test was used for rare responses.

The Public Opinion Laboratory is a full-service survey research center in DeKalb, Illinois. The Institutional Review Boards of both the University of Chicago and Northern Illinois University approved the research instrument.

RESULTS

Respondents were equally distributed throughout the age range (median and mean ages, 36 years [standard deviation 9.44 years]). They were representative of the nation according to race, Hispanic ancestry, marital status, household size, median household income, educational status, and religious affiliation. (Table I, column 1). There was an increase in the total number of people with or considering getting body art (tattoos and body piercings) in each

Table IIIA. Associations of tattooing related to the age of first application before or after age 18 years

Tattoo associations	First tattoo <18 y, No. (%)	First tattoo ≥ 18 y, No. (%)	Fisher exact test (2-sided)
Total, No. (%)	19 (16)	99 (84)	
Medical problems within the first 2 weeks*	6 (32)	9 (9)	.02
Social/work problems due to tattoo	5 (26)	14 (14)	NS
Did not finish high school	5 (26)	13 (13)	NS
At least some graduate school	0	8 (8)	NS
Jailed for ≥ 3 days	9 (47)	20 (20)	.02
Drunk at time of first tattoo	4 (21)	6 (6)	NS
Ever taken recreational drugs	15 (83)	41 (43)	χ ² .002
High at time of first tattoo	6 (32)	6 (6)	NS
First tattoo placed in a tattoo parlor	7 (37)	85 (86)	<.001
Professional tattoo gun for first tattoo	10 (53)	85 (86)	.002
Professional artist made first tattoo	10 (53)	87 (88)	.001
A friend/acquaintance made first tattoo	7 (37)	9 (9)	.004
Had at least one tattoo done outside a studio	6 (32)	13 (13)	NS
Ever considered having a tattoo removed	4 (21)	16 (16)	NS
Ever considered having a tattoo covered	5 (26)	4 (4)	.007
Ever had a tattoo covered	0	6 (6)	NS
Has plans to get another tattoo	11 (58)	29 (29)	χ ² .01
Would consider another tattoo	7 (37)	35 (35)	NS
No plans to get/would not consider another tattoo	1 (5)	35 (35)	χ ² .01

NS, Not statistically significant.

*Included weeping (fluid discharge), crusting, bleeding, swelling, scarring, itching, tenderness, redness, and sun sensitivity. No one said a problem lasted longer than, and only people said a problem (swelling in 1 and itching in both) occurred later than, 2 weeks after a tattoo was done.

successive age group. (Table I and Fig 1). The start of the modern fashion occurred in the early 1990s and has continued to increase. Tattooing was happening as far back as 1969, when our first tattooed respondent was only 16, but body piercing was not seen until 1982.

Tattooing

Three hundred forty-four tattoos were present among 120 (24%) respondents, 60 of whom had multiple tattoos with a range of 1 to 60. Tables I, IIA and IIB, and IIIA and IIIB show additional data and associations. An additional 104 (21%) nontattooed respondents had considered tattoo placement. (Fig 1). Younger respondents were more likely to have multiple tattoos than the older cohorts. Thirty percent of women compared with 11% of men had obtained their first tattoo when they were older than 30 years of age. Overall, 65% of those with a tattoo had obtained their first tattoo by 24 years of age. Tattooed individuals were more likely to have a close friend and/or family member with a tattoo than nontattooed individuals (90% vs 63%; $P < .001$).

Tattooed respondents were less likely to claim a religious affiliation than the nontattooed. Younger people were less likely to claim a religious affiliation than older people, but these variables behaved independently with respect to their association with the prevalence of tattooing.

Table IIIB. Associations of body piercing

	N (%)
Total, No. (%)	72 (100)
First BP before age 18 y ^{*,†}	21 (30)
Ever allowed a BP to close due to medical problems during the first 3 wk [‡]	4 (6)
Ever allowed a BP to close due to medical problems later than 3 wk [‡]	1 (0.2)
Ever allowed a BP to close for nonmedical reasons	34 (48)
Considered allowing a BP to close for nonmedical reasons	3 (4)
Drunk at time of first BP	3 (4)
High at time of first BP	4 (5)

BP, Body piercing.

*Total number of BPs does not add up to 72 because of 2 absent responses.

†There was no difference in any of the measures between those who obtained their first BP younger than 18 years and those who obtained it at or after 18 years of age.

‡Included discomfort, pain, tenderness, redness, swelling, itching, bleeding, weeping (fluid discharge,) and pus.

To evaluate the educational status of those who had body art, we looked only at respondents aged 24 years and older so that they had had a chance to complete college and to start graduate school. At all levels of education, the prevalence of tattoos was



significantly higher among those of lower compared with those of higher educational status. Of those with tattoos, 67% who did not finish high school versus 38% who had attended graduate school had multiple tattoos. Using the 5 educational categories shown in Table I, the breakeven point for multiple tattoos compared with solitary tattoos was among those who had attended some college.

The question "Have you been in jail for three days or longer?" was asked to separate those who had committed serious offenses from those who had been jailed for minor infractions. Of those with tattoos, 76% who had been in jail for 3 days or more versus 41% who had not been in jail for 3 days had multiple tattoos ($P = .001$). Nine percent of tattooed individuals claimed to be drunk or high at the time of their first tattoo. Fewer were drunk or high at the time of their most recent tattoo. Compared with the general population, the percentage of those with a tattoo was lower among respondents who had never had a drink and higher among the presumed problem drinkers; that is, the 13% of the total population who had been drinkers in the past but now no longer drank. Among current drinkers, those with tattoos had had more than 5 drinks on a mean number of 4 days during the previous month compared with only 1 day among those without tattoos ($P < .05$).

Recreational drug use was significantly more common among the tattooed than the nontattooed. More men than women had tried recreational drugs, but among those with tattoos this difference was not significant.

Ninety-eight percent of tattooed respondents had acquired their tattoos within the United States. Two hundred nineteen (64%) of the tattoos among 96 (80%) of the respondents were obtained in a tattoo shop. Thirty-two tattooed respondents (26%) had either tattooed themselves or had had someone else do it somewhere other than in a studio. A professional artist using a tattoo gun in a tattoo parlor had done the vast majority of initial and most recent tattoos. A few people, especially those younger than 18 years of age, had used a homemade tattoo gun or injection or sewing needles (Table IIIA).

Of the 15 respondents who had had local medical problems with a tattoo during the first 2 weeks, 9 had had that tattoo done by someone outside a tattoo parlor. Problems included all those asked (see footnotes in Table IIIA). Three people noticed sun sensitivity within the first 2 weeks.

Being treated differently at work or in social settings was unusual. Six people said visible tattoos were not allowed at work and an additional 2 respondents were prohibited from doing certain tasks. Fourteen respondents were treated differently in social settings.

This included 8 respondents who had received compliments, 5 who were snubbed, ignored or ridiculed, and 5 were treated as someone they were not.

No one had had a tattoo removed, although 20 (17%) had considered it. Six (5%) had had a tattoo covered, and an additional 9 (8%) were considering having a tattoo covered.

Body piercings

One hundred seventy-six respondents (35%) reported having had piercings. One hundred four (59%) of these had only had soft ear lobe piercings. Seventy-two (14%) of all respondents had ever had a nonsoft ear lobe piercing, henceforth called body piercing (Table I). Only 6 (3%) of those with a body piercing did not have a soft ear lobe pierced (Table IIB). An additional 45 (9%) of all respondents had considered getting a body piercing (Fig 1). Seventy-four percent of those who had a body piercing had obtained their first by the age of 24. Individuals who had body piercing were more likely to have a close friend and/or family member with a body piercing than those without a body piercing (96% vs 51%; $P < .001$).

Looking at respondents who were 24 years of age and older, the prevalence of body piercing did not vary by educational status. Over the entire data set, body piercing did not vary by income (Table I) or broadly identified job categories (data not shown). For each of the variables, the absolute figures were smaller, but the findings were similar to those for tattoos with respect to religious affiliation, time spent in jail, alcohol consumption, and the use of recreational drugs (Table I). Very few people claimed to have been drunk or high at the time of their first or most recent body piercing (Table IIB). Most body piercings were performed in a professional parlor or shop, although 14 people had done at least one on themselves and another 9 respondents had had someone else do a body piercing somewhere other than in a professional studio.

Thirty (42% of) respondents with body piercing had their first one in the hard cartilage of an ear and 21 (70%) of these went on to get additional body piercings. Medical problems occurred in 3 respondents during the first 3 weeks, in 11 respondents later than 3 weeks, and in 2 respondents medical problems started during and lasted longer than the first 3 weeks after a body piercing, for a total of 16 (23% of) respondents reporting medical problems (see list of problems, Table IIB). Navel piercing was the most problematic. An additional 6 (23% of) respondents with mouth or tongue piercings or both said they had had chipped or broken teeth.

Table IV. Allergic to jewelry made from certain metals

	No piercings	Soft ear lobes only	1-3 piercings	≥ 4 piercings	P value
Total, No.	324	104	138	38	
Total allergic (%)	37 (12)	26 (25)	40 (29)	14 (39)	<.001
Male respondents, No.	199	28	35	13	
Males allergic (%)	7 (4)	2 (7)	5 (14)	3 (23)	Trend
Female respondents, No.	125	76	103	25	
Females allergic (%)	30 (24)	24 (32)	35 (34)	11 (44)	Trend

All estimates include piercings that have closed. Soft ear lobes counted as one piercing. There was no difference in the prevalence of jewelry allergy between those with 1 to 3 piercings and those with soft ear lobe piercings only.

The prevalence of jewelry allergy was evaluated separately from that of the other medical complications (Table IV).

Sixteen (22%) and 10 (14%) of those with body piercings were treated differently at work and in social situations, respectively. Eight respondents said that visible body piercings were not allowed at work and 2 more were prohibited from performing certain tasks. Equal numbers of visible and covered body piercings had been allowed to close (Table IIIB). Mostly, people had “just got bored” with the body piercing.

A doctor had told 19 respondents that they had had hepatitis: 5 had had hepatitis A, 5 hepatitis B, 7 hepatitis C, and 2 did not know the type. One respondent claimed to have gotten hepatitis C through the tattoo ink.

DISCUSSION

The 33% response rate for this RDD survey is within the expectable range given the known increasing difficulties of doing telephone surveys.⁶ Importantly, refusals were not related to the body art content of the questionnaire and, as such, should not have contributed to any systematic bias in the results.

Our findings of a national prevalence rate of 24% tattooing among people 18 to 50 years old are very similar to the findings of two 2003 national probability samples, both of which asked only a few questions about the practice.^{7,8} Other studies of specifically chosen groups (eg, military recruits⁹ or students attending introductory anthropology classes at a large public university^{10,11} and a national representative sample of adolescents¹²) have found tattoos to be equally common among men and women. As in the past, tattooing is more common among those of low socioeconomic and educational status, despite its increased prevalence across all social groups. This has been documented by others using randomized but convenience samples.¹³

The prevalence of the various tattoo body locations echoes previous data.¹⁴ The persistence of a

social stigma related to tattooing in women may be reflected in the fact that many had tattoos on their backs, an area easily hidden by clothes, although more than one fourth were tattooed on the ankles. In addition, women had a lesser percentage of body surface area covered by tattoos than men. A contradiction to this hypothesis is found in the later age of first tattoo placement in women than in men. A previous study of nonrandomly selected women documented that 73% of first-time tattoos were placed on women who were older than 25 years of age, and 80% of these women did not see getting a tattoo as deviant behavior. Many had carefully weighed the risks and benefits in advance.¹⁵

We found no difference in tattoo prevalence between ethnic groups, with presumably all gradations of skin color, except that tattoos were twice as common among those with Hispanic ancestry than all other ethnic groups combined. Presumably permanently decorating the skin is a fashion or a cultural practice rather than appearance driven.

As expected, we found that more men associated with the military had tattoos.¹⁶

Despite the lumping of tattooing with body piercing under the name of body art, and the known association between these activities, not all the socially-related findings are the same, body piercing being more prevalent in women than men.^{17,18} Our finding of approximately half the female respondents having a soft ear lobe piercing accords with other studies.¹⁹ We have seen no other randomly selected adult population-based probability samples of body piercing.²⁰

Body piercing varies little by educational status. However, as with tattooing, body piercing occurs more among those who partake in risky activities, such as heavy drinking, drug taking, and actions that lead to incarceration. Two respondents claimed that they had allowed a body piercing to close because this was required in jail, supporting the idea that it is not jail time itself that leads to piercing, but rather the social characteristics of those who land in jail. This has been found in a random household survey in



Australia,²¹ an RDD survey of teenagers in Canada,²² and a study of adolescent military beneficiaries in San Diego.²³ Some studies of specifically chosen groups have found tattoos to be more closely associated with heavy drinking and drug taking than body piercings,²⁴ and a large survey of students selected on the basis of the presence of body art found that body piercings were more often associated with impulsive decision making than tattoos.²⁵

Tattooing is prohibited in the Old Testament^{26,27} and in the Koran,²⁸ but it seems more likely that in contemporary American society the fact that the less religious sport more body art is related to a lack of feeling of community among those who do not actively belong to religious institutions. This is one aspect of creating identity and may also explain the continued association of tattooing with gang membership and, by default, prison time.^{29,30}

Persistent local health problems were rare after tattooing. Of the respondents reporting increased sun sensitivity, none said this was a problem past 2 weeks.³¹ On the other hand, ongoing local problems, including broken or chipped teeth following body piercing in the mouth, were reported in approximately one third of those with body piercing.

This figure does not include the correlation of increasing numbers of body piercings and the prevalence of self-reported jewelry allergy. The correlation of the prevalence of patch test–proven metal allergy with the presence of ear piercings has been reported in population-based and convenience samples in Scandinavia^{19,32} and in a randomly selected convenience sample of 118 men in Kansas.³³ Presumably, the high base rate (24%) for this allergy in women is related to the wearing of metal jewelry, whereas men without body piercing are less likely to wear jewelry. It is unlikely that a metal-allergic individual would continue to get piercings, explaining the declining allergy rate as the numbers of piercings increased above 5. These, and the low male piercing numbers, are explanations for the gender-related data presented showing trends rather than true statistical significance.

Using this methodology, we did not expect to identify some important and remote medical complications, for example, endocarditis^{34,35} and transfusion-transmitted diseases,^{36,37} known to be risks following procedures that puncture skin. We knew in advance that with an estimated 1.8% prevalence of hepatitis C in the general US population,³⁸ we would not be able to make any clear association of hepatitis C incidence with that of body art application, but we are encouraged that our hepatitis data resemble other estimates and believe that RDD may be a method of identifying associations.³⁹⁻⁴¹

Just over one fourth of those with tattoos and almost one third of those with body piercing had acquired some body art outside a dedicated studio. Theoretically, the risk of infection may be higher in those situations, but the risk of passing transfusion-transmitted diseases may be less, excluding placement in prison or in other shared needle venues, than in a studio where customer volume is high and understanding of universal precautions and other hygienic measures is limited.^{42,43}

Few states have effective regulation relating to the application of body art,⁴⁴⁻⁴⁶ and it is known that up to 75% of adolescents who have tattoos or body piercings do not seek permission from or even inform their parents.⁴⁷ Our data show that these activities often occur before 18 years of age.

The real question is whether in modern America any association found is related to direct transmission of disease through the needle pricks or whether tattoos and body piercings are markers for other risky behaviors, which lead to infection with a transmissible agent.⁴⁸ We have documented that these associations continue to exist.

We thank the staff at the Survey Research Laboratory at the University of Chicago for their help in the preparation of the original questionnaire and Mahesh Baranwal, PhD, for his paid statistical consultation.

REFERENCES

1. DeMello M. Bodies of inscription: a cultural history of the modern tattoo community. Durham (NC): Duke University Press; 2000.
2. Beckwith C, Fisher A. The eloquent Surma of Ethiopia. *National Geographic* 1991;179(2):77-91.
3. Biggar RJ, Haughie GE. Medical problems of ear piercing. *NY State J Med* 1975;75:1460-2.
4. Anderson RR. Tattooing should be regulated. *N Engl J Med* 1992;326:207.
5. Standard definitions: final dispositions of case codes and outcome rates for surveys. American Association for Public Opinion Research; 2004.
6. Langer G. About response rates. *Some unresolved questions. Public Perspective*. 2003(May/June):16-8.
7. SHOH 23. National Random Survey, May 4-18, 2003. Scripps Survey Research Center at Ohio University. Available at: <http://www.newspoll.org>. Accessed May 16, 2006.
8. Harris Poll Interactive. The Harris Poll #58. Available at: http://www.harrisinteractive.com/harris_poll/index.asp?pid=407. Accessed May 16, 2006.
9. Stephens MB. Behavioral risks associated with tattooing. *Fam Med* 2003;35:52-4.
10. Forbes GB. College students with tattoos and piercings: motives, family experiences, personality factors, and perception by others. *Psychol Rep* 2001;89:774-86.
11. Armstrong ML, Murphy KP. Tattooing: another adolescent health risk behavior warranting health education. *Appl Nurs Res* 1997;10:181-9.
12. Roberts TA, Ryan SA. Tattooing and high-risk behavior in adolescents. *Pediatrics* 2002;110:1058-63.

13. Rooks JK, Roberts DJ, Scheltema MA. Tattoos: their relationship to trauma, psychopathology, and other myths. *Minn Med* 2000;83:24-7.
14. Drews DR, Allison CK, Probst JR. Behavioral and self-concept differences in tattooed and nontattooed college students. *Psychol Rep* 2000;86:475-81.
15. Armstrong ML. Career-oriented women with tattoos. *Image J Nurs Sch Winter* 1991;23:215-20.
16. Armstrong ML, Murphy KP, Sallee A, Watson MG. Tattooed Army soldiers: examining the incidence, behavior, and risk. *Mil Med* 2000;165:135-41.
17. Mayers LB, Judelson DA, Moriarty BW, Rundell KW. Prevalence of body art (body piercing and tattooing) in university undergraduates and incidence of medical complications. *Mayo Clin Proc* 2002;77:29-34.
18. Armstrong ML, Roberts AE, Owen DC, Koch JR. Contemporary college students and body piercing. *J Adolesc Health* 2004;35:58-61.
19. Nielsen NH, Menne T. Nickel sensitization and ear piercing in an unselected Danish population. *Glostrup Allergy Study. Contact Dermatitis* 1993;29:16-21.
20. Roberts TA, Auinger P, Ryan SA. Body piercing and high-risk behavior in adolescents. *J Adolesc Health* 2004;34:224-9.
21. Makkai T, McAllister I. Prevalence of tattooing and body piercing in the Australian community. *Commun Dis Intell* 2001;25:67-72.
22. Special Report on Youth, Piercing, Tattooing and Hepatitis C TrendsCan findings. Toronto, Ontario: Youth Culture Inc., Hepatitis C Division, Health Canada; March 2001.
23. Carroll ST, Riffenburgh RH, Roberts TA, Myhre EB. Tattoos and body piercings as indicators of adolescent risk-taking behaviors. *Pediatrics* 2002;109:1021-8.
24. Braithwaite R, Robillard A, Woodring T, Stephens T, Arriola K. Tattooing and body piercing among adolescent detainees. *J Subst Abuse Treat* 2001;13(1-2):5-16.
25. Greif J, Hewitt W, Armstrong ML. Tattooing and body piercing. Body art practices among college students. *Clin Nurs Res* 1999;8:368-85.
26. Leviticus 19:28. Old Testament.
27. Deuteronomy 14:1. Old Testament.
28. Surah 7:46. Koran.
29. Bell S. Tattooed: a participant observer's exploration of meaning. *J Am Culture* 1999;99:53-9.
30. Papachristos AV. Gang world. *Foreign Policy* 2005;March/April:49-55.
31. Sowden JM, Byrne JP, Smith AG, Hiley C, Suarez V, Wagner B, Slater DN. Red tattoo reactions: X-ray microanalysis and patch-test studies. *Br J Dermatol* 1991;124:576-80.
32. Meijer C, Bredberg M, Fischer T, Widstrom L. Ear piercing and nickel and cobalt sensitization, in 520 young Swedish men doing compulsory military service. *Contact Dermatitis* 1995;32:147-9.
33. Ehrlich A, Kucenic M, Belsito D. Role of body piercing in the induction of metal allergies. *Am J Contact Dermatitis* 2001;12:151-5.
34. Satchithananda DK, Walsh J, Schofield PM. Bacterial endocarditis following repeated tattooing. *Heart* 2001;85:11-2.
35. Akhondi H, Rahimi AR. Haemophilus aphrophilus endocarditis after tongue piercing. *Emerg Infect Dis* 2002;8:850-1.
36. de Nishioka SA, Gyorkos TW. Tattoos as risk factors for transfusion-transmitted diseases. *Int J Infect Dis* 2001;5:27-34.
37. Hayes M, Harkness G. Body piercing as a risk factor for viral hepatitis: an integrative research review. *Am J Infect Control* 2001;29:271-4.
38. Alter MJ, Kruszon-Moran D, Nainan OV, McQuillan GM, Gao F, Moyer LA, et al. The prevalence of hepatitis C virus infection in the United States, 1988 through 1994. *N Engl J Med* 1999;341:556-62.
39. Haley RW, Fischer RP. Commercial tattooing as a potentially important source of hepatitis C infection. Clinical epidemiology of 626 consecutive patients unaware of their hepatitis C serologic status. *Medicine (Baltimore)* 2001;80:134-51.
40. Nishioka Sde A, Gyorkos TW, Joseph L, Collet JP, MacLean JD. Tattooing and transfusion-transmitted diseases in Brazil: a hospital-based cross-sectional matched study. *Eur J Epidemiol* 2003;18:441-9.
41. Haley RW, Fischer RP. The tattooing paradox: are studies of acute hepatitis adequate to identify routes of transmission of subclinical hepatitis C infection? *Arch Intern Med* 2003;163:1095-8.
42. Hellard M, Aitken C, Mackintosh A, Ridge A, Bowden S. Investigation of infection control practices and knowledge of hepatitis C among body-piercing practitioners. *Am J Infect Control* 2003;31:215-20.
43. Oberdorfer A, Wiggers JH, Bowman J, Burrows S, Cockburn J, Considine RJ. Monitoring and educational feedback to improve the compliance of tattooists and body piercers with infection control standards: a randomized controlled trial. *Am J Infect Control* 2004;32:147-54.
44. Tope WD. State and territorial regulation of tattooing in the United States. *J Am Acad Dermatol* 1995;32:791-9.
45. Armstrong ML. Tattooing, body piercing, and permanent cosmetics: a historical and current view of state regulations, with continuing concerns. *J Environ Health* 2005;67:38-43, 53, 54.
46. Braithwaite RL, Stephens T, Sterk C, Braithwaite K. Risks associated with tattooing and body piercing. *J Public Health Policy* 1999;20:459-70.
47. Armstrong ML, McConnel C. Tattooing in adolescents: more common than you think—the phenomenon and risks. *J School Nurs* 1994;10:26-33.
48. Nishioka Sde A, Gyorkos TW, Joseph L, Collet JP, Maclean JD. Tattooing and risk for transfusion-transmitted diseases: the role of the type, number and design of the tattoos, and the conditions in which they were performed. *Epidemiol Infect* 2002;128:63-71.