Indoor Tanning and Problem Behavior

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Abstract. **Objective**: The authors examined factors predicting college students' use of tanning beds. **Participants** and **Methods**: Undergraduate students ($N = 745$) at a large Northeastern university participated in the study by answering a survey measuring tanning behavior and other psychosocial variables, including sensation seeking, self-esteem, tanning image beliefs, and friends' tanning bed use. **Results**: All 3 systems from problem behavior theory predicted past tanning bed use and intention to use tanning beds. The authors observed a positive association between sensation seeking and intention to use tanning beds. Tanning image beliefs were positively associated with both past tanning behavior and intention to use tanning beds. **Conclusions**: Interventions focusing on friend and acquaintance social network influences may be more effective than health-risk campaigns in reducing tanning bed use.

Keywords: college students, problem behavior theory, risk behavior, self-esteem, sensation seeking, skin cancer, tanning

S kin cancer is the most common type of cancer in the United States, and the rates of skin cancers are rising.[1,2] This alarming data prompted the Centers for Disease Control and Prevention and the National Institutes of Health to include in their *Healthy People 2010* project goals reducing the number of skin cancer deaths and increasing the number of people who follow protective measures such as avoiding ultraviolet (UV) light and sun exposure.[3]

Despite teenagers' knowledge about harmful effects of UV radiation on skin, they continue to tan.[4] The popularity of tanning bed use among US adolescents could be attributed to several factors, such as emphasis on physical appearance,[5] a belief that looking tan enhances one's attractiveness, media images of tanned celebrities,[6,7] and aggressive ad campaigns by the tanning industry.[7] In the present

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study, we used problem behavior theory to examine the possible relationships between tanning behavior and other psychosocial variables.[8,9]

Problem Behavior Theory

Problem behavior theory is derived from a social–psychological framework and proposes that engagement in risk behavior could be attributed to the interactions between variables from 3 major systems: personality, environment, and behavior.[8,9]

All 3 systems are interrelated and tend to cluster in the same individual. Although not previously applied to tanning bed use, problem behavior theory predicts a variety of risk behaviors, including drinking and drug use,[10] exposure to violent television,[11] and high-risk sexual behavior.[12]

Personality System

The personality system of problem behavior theory is concerned with cognitive variables that are reflective of social meaning and developmental experience.[8,13] Individuals' beliefs, values, and attitudes are a part of this system. We focused on 3 personality variables: self-esteem, sensation seeking, and tanning image beliefs. We included self-esteem and sensation seeking because they have been examined extensively in relation to risk behaviors and appear to be linked to other risk behaviors.[14]

Self-Esteem. Jessor[13] asserts that a person with lower self-esteem has little to lose; thus, people with lower self-esteem are more likely to engage in risk behaviors. Because tanned people may be perceived as more attractive,[5,6] it stands to reason that adolescents with lower self-esteem will be more likely to use tanning beds to improve their self-image and that higher level of self-esteem will work as a protective mechanism to avoid risky tanning behavior. Thus, we propose the following hypothesis:

H1. The higher the adolescents' self-esteem, the less likely they will be to use and intend to use tanning beds.

Sensation Seeking. Sensation seeking is a personality trait that taps the tendency to seek varied, novel, and intense sensations and experiences.[15] Several researchers have examined the relationship between sensation seeking traits and motivation to engage in risk behaviors.[14] Tanning behavior correlates significantly with higher levels of sensation seeking, particularly thrill seeking.[16] Thus, we suggest that higher sensation seekers will be more likely to engage in tanning behavior.

H2. Adolescents who score higher on sensation seeking will be more likely to use and intend to use tanning beds; this relationship will be stronger for women.

Tanning Image Beliefs. Beliefs regarding tanning bed use may explain the psychological effects associated with a tanned look, such as wanting to look healthier, feel more confident, and appear attractive.[17] Beliefs and attitudes associated with tanning are the best predictors of tanning intentions.[7,17] In addition, beliefs concerning image and appearance are stronger than beliefs concerning health-related motivations.[7]

H3. Adolescents with greater beliefs that tanned images are attractive will be more likely to use and have greater intentions to use tanning beds.

Perceived Environmental System

The perceived environmental system of problem behavior theory includes variables associated with peer approval and norms, as well as level of parental control and level of exposure to peers' modeled behavior.[8] Variables that belong to this system are associated with support, influence, controls, models, and others' expectations. Researchers[18,19] have most often addressed peer engagement in problem behavior (eg, friends' smoking or spending time with a group that drinks) as a predictor of different problem behaviors. This suggests that engagement in any risky behavior, including tanning, could be a result of adolescents' perceived support from others and leads to the following hypothesis:

H4. Friends' and acquaintances' use of tanning beds will be positively associated with adolescents' use of and intention to use tanning beds.

Behavior System

The behavior system of problem behavior theory includes variables that require specific actions (eg, smoking, drug use, violence, theft). By building on the behavior system, tanning behavior could be conceptualized as a risk behavior. Armes[16] observed a positive correlation between tanning bed use and other risk behaviors, such as smoking, drinking, and unsafe sex. Adolescents who report the use of 2 or 3 substances are more likely to use indoor tanning.[20] In addition, problem behavior theory suggests that people who are engaged in risk behaviors in general are less likely to engage in preventive behavior. In the context of tanning behavior, we hypothesized:

H5. Engagement in lifestyle risk behaviors—such as smoking, drinking, and sun risk behavior (eg, going to the beach, laying out)—will be positively associated with the use of, and intention to use, tanning beds.

Co-occurrence Between Different Problem Behaviors

Other variables may moderate or mediate the co-occurrence between adolescent problem behaviors. For example, Yanovitzky[19] demonstrated that sensation seeking, risk factors (eg, unsupervised time with peers, frequency of school absences), and lack of certain protective factors (eg, religiosity, positive family relationship, school performance) contributed to an association with deviant peers, which led to pro-drug discussions and a greater intention to use drugs. Therefore, we proposed:

H6. There are significant associations between personality factors (self-esteem, sensation seeking, and tanning image beliefs) and lifestyle risk behaviors (smoking, drinking, sun risk behavior, use of tanning beds, and intention to use tanning beds).

Because we used an integrated approach addressing all 3 systems in problem behavior theory together, we asked:

RQ. How well do the 3 systems of problem behavior theory predict tanning bed use and future intention to use tanning beds?

METHODS

Participants and Procedure

This study was a part of a larger project on tanning attitudes, intentions, and behaviors approved by a university internal review board. We recruited participants from undergraduate communication courses at a large Northeastern US university. The initial sample included 898 students; however, we excluded students older than 25 years and naturally dark-skinned students, the latter of which are are less likely to tan and are generally at lower risk of skin cancer.[21] We used self-reported skin color rather than race or ethnicity to capture more variation in the relevant construct and eliminated the 130 participants with the darkest reported skin color. This resulted in 745 participants retained for analysis. Students' ages ranged from 19 to 25 years (M = 21.04 years, SD = 1.16), and 65% were women. The majority (64%) of participants were Caucasian, with 16% Asian/Pacific Islander, 6% Hispanic/Latino, 4% bi- or multiracial, 3% African American, and less than 2% other. Students participated in this study in early December 2005 outside of class time and received extra credit for their participation. After providing written consent, participants entered a room to fill out an anonymous survey (approximately 20 minutes). We debriefed participants after they completed the questionnaire.

Measures

The questionnaire measured variables from the personality system, perceived environmental system, behavior system, tanning bed intention, and past tanning bed use.

Self-Esteem

We measured self-esteem by 5 Likert-type items from Hudson's[22] scale, with 5-point responses ranging from 1 (*never)* to 5 (*always*). The reliability was good (α = .87), and factor analysis indicated a single-factor structure (eigenvalue = 3.27, 65.31% variance), with all loadings higher than .75. We summed and averaged responses, with a higher score indicating a higher level of self-esteem (*M* = 3.97, *SD* = 0.55).

Sensation Seeking

On the basis of Form V of Zuckerman's[15] sensation-seeking scale, Hoyle et al[23] created the 8-item sensation seeking scale. It is a Likert-type scale with 5-point responses ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). Reliability for this scale was good (α = .78), and factor analysis indicated a single-factor structure (eigenvalue = 3.24, 40.44% variance), with loadings greater than .60. We deleted 1 item from the scale ("I get restless when I spend too much time at home") to maintain the single-factor structure. We summed and averaged the scores on the scale, with higher scores indicating more sensation-seeking traits (*M* = 3.49, *SD* = 0.71).

Tanning Image Beliefs

We created the measure of tanning image beliefs, which consisted of 6 Likert-type items, with 5-point responses ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). Reliability for this scale was good (α = .79), and factor analysis indicated a single-factor structure (eigenvalue = 2.99, 49.76% variance), with all loadings greater than .50. We summed and averaged the scores on the scale, with higher scores indicating more beliefs supporting tanning (*M* = 3.36, *SD* = 0.71).

Friend Tanning Bed Use

We measured friend tanning bed use by a single item: self-reported number of friends using tanning beds (*M* = 4.65, *SD* = 7.76, range = 0–90).

Acquaintance Tanning Bed Use

We measured acquaintance tanning bed use by 1 item: self-reported number of acquaintances using tanning beds regularly (*M* = 7.97, *SD* = 12.22, range = 0–100).

Sun Risk Behavior

For this study, we developed a measure of sun risk behavior that comprised 2 Likert-type items assessing past-summer sun exposure, with responses ranging from 1 (*never*) to 5 (*always*). Reliability was good (α = .78), and factor analysis indicated a single-factor structure (eigenvalue = 1.64, 81.99% variance), with both loadings greater than .90. We summed and averaged the scores on the scale, with higher scores indicating greater sun risk behavior (*M* = 2.96, *SD* = 0.96).

Smoking

We measured smoking by 2 items (eg, "How many days in the past month did you use tobacco products?") that we converted to *z* scores. The 2 items had good reliability (α = .84) and loaded higher than .90 on 1 factor (eigenvalue = 1.72, 86.08% variance). We summed and averaged the 2 items, with a higher score indicating heavier smoking.[24]

Alcohol Consumption

We measured alcohol consumption by 3 items (eg, "Within the past 2 weeks, how many times have you had 5 or more drinks in a sitting?") that we converted to *z* scores. The 3 items had excellent reliability (α = .90) and loaded higher than .90 on 1 factor (eigenvalue = 2.50, 83.37% variance). We summed and averaged the 3 items, with a higher score indicating heavier drinking.[25]

Tanning Bed Intention

We measured tanning bed intention by 1 item, with responses on a 5-point Likert-type scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). A higher score indicated a greater intention to use a tanning bed next semester (*M* = 2.27, *SD* = 1.40).

Past Tanning Bed Use

We measured past tanning bed use by 1 free-response item asking "How many times have you used a tanning bed in the past year?" (*M* = 4.28, *SD* = 10.22, range = 0–100).

RESULTS

We performed correlations to examine H1–H5, setting the level of significance at $p \leq .01$ to protect against Type I error. (Table 1 presents a zero order correlation matrix for all variables.) To examine H6, we performed a canonical correlation, with the level of significance set at $p \leq .05$. Last, we examined RQ using hierarchical multiple regression ($p \leq .05$).

H1 examined the association between adolescents' self-esteem and likelihood of using tanning beds (see Table 1). The correlations between self-esteem and past tanning (r = .04), and between self-esteem and intention to use tanning beds (r = .01) were not significant. H1 was not supported, and we observed no association between self-esteem and tanning bed use.

H2 examined the association between adolescents' sensation seeking and likelihood of using tanning beds (see Table 1). The correlation between sensation seeking and intention to use tanning beds was positive (r = .13, $p \leq .001$). Thus, higher levels of sensation seeking were related to higher intentions of tanning bed use. The correlation between sensation seeking and past tanning bed use (r = .08) was not significant. For men, the correlation between sensation seeking and intention to use tanning beds was positive (r = .19, $p \leq .01$). The correlation between sensation seeking and past tanning bed use (r = .09) was not significant. For women, the correlation between sensation seeking and intention to use tanning beds was positive (r = .20, $p \leq .001$). The correlation between sensation seeking and past

TABLE 1. Zero Order Correlation Matrix for All Variables

Variable	1	2	3	4	5	6	7	8	9	10	11	12
1. Self-esteem	—											
2. Sensation seeking	.01	—										
3. Tanning image beliefs	−.04	.15**	—									
4. Acquaintance tanning	.11*	.14**	.27**	—								
5. Friend tanning	.08	.11*	.24**	.63**	—							
6. Sun risk	−.06	−.12**	−.41**	−.23**	−.23**	—						
7. Smoking	.04	.20**	.06	.06	.07	−.06	—					
8. Alcohol	.03	.38**	.20**	.25**	.26**	−.18**	.23**	—				
9. Intention to tan	.01	.13**	.49**	.36**	.33**	−.38**	.11*	.18**	—			
10. Past tanning	.04	.08	.37**	.32**	.28**	−.26**	.04	.14**	.61**	—		
11. Age	.13**	−.01	.02	−.07	−.04	.02	.16**	.11*	−.03	−.03	—	
12. Sex	−.04	−.21**	.12*	.01	.02	−.14**	−.07	−.37**	.25**	.23**	−.07	—

Note. For sex, 1 = female, 0 = male.
*$p < .01$. **$p < .001$.

tanning bed use was also positive ($r = .16$, $p \leq .001$). Thus, H2 was partially supported, with results showing a positive association between sensation seeking and intention to use tanning beds but not past tanning bed use. This association was slightly stronger for women than for men.

H3 examined the association between use of tanning beds and tanning image beliefs. We found strong correlations between tanning image beliefs and tanning bed use intention ($r = .49$, $p \leq .001$) and between tanning image beliefs and past tanning bed use ($r = .37$, $p \leq .001$). Thus, the data supported H3.

H4 examined the association between use of tanning beds and acquaintance and friend tanning bed use. We observed a positive correlation between acquaintance tanning bed use with tanning bed use intention ($r = .36$, $p \leq .001$) and with past tanning bed use ($r = .32$, $p \leq .001$). The correlations between friend tanning bed use and tanning bed use intention ($r = .33$, $p \leq .001$) and past tanning bed use ($r = .28$, $p \leq .001$) were also positive. Thus, our findings supported H4.

H5 examined the association between lifestyle risk behaviors and use of tanning bed. Intention to use tanning beds was inversely associated with sun risk behavior ($r = −.38$, $p \leq .001$) and positively associated with smoking ($r = .11$, $p \leq .01$) and drinking ($r = .18$, $p \leq .001$). Thus, greater intention to use tanning beds is associated with more smoking and drinking and less sun risk behavior. Past tanning bed use was positively associated with drinking ($r = .14$, $p \leq .001$) but inversely associated with sun risk behavior ($r = −.26$, $p \leq .001$). Thus, greater past tanning bed use was associated with more drinking and less sun risk behavior. Overall, results show partial support for H5 such that intention to use tanning beds is positively associated with smoking and drinking, whereas past tanning bed use is positively associated with drinking only.

H6 examined the associations between personality factors and risk behaviors (see Table 2). The canonical correlation was significant ($F[19, 1,938] = 27.24$, $p < .001$). The

first canonical root yielded a canonical correlation of .57 ($F[15, 1,938] = 27.24$, $p < .001$), with an eigenvalue of .49, capturing 33% of the standardized variance in the lifestyle risk behaviors. The second canonical root yielded a canonical correlation of .34 ($F[8, 1,406] = 11.61$, $p < .001$), with an eigenvalue of .13, capturing 12% of the standardized variance in the lifestyle risk behaviors. The third canonical root was not significant. We report only correlations of .30 or greater.

For the first function, personality variables, sensation seeking ($r = .45$) and tanning image beliefs ($r = .94$) loaded highest on function 1. We labeled this latent factor *personality*. For the risk behaviors, drinking ($r = .53$), sun risk behavior ($r = −.71$), past tanning bed use ($r = .63$), and intention to use tanning beds ($r = .83$) loaded highest on function 1 (but not smoking). We labeled this latent factor *risk behavior*.

For the second function, personality variables, sensation seeking ($r = −.89$), and tanning image beliefs ($r = .32$) loaded highest on function 1 (but not self-esteem). We labeled this latent factor *personality*. For the risk behaviors, smoking ($r = −.50$) and drinking ($r = −.79$) loaded highest on the second function (but not sun risk behavior, past tanning bed use, and intention to use tanning beds). We labeled this latent factor *risk behavior*. Thus, overall results partially supported H6. We observed significant associations between personality factors and lifestyle risk behaviors.

RQ addressed the contribution of the 3 systems in predicting tanning behavior. We performed 2 block multiple regressions to explore this question. We entered controls (age and sex) on the first step. We entered personality variables on the second step and perceived environmental and behavior variables on the third and final step. We ran this regression twice, first predicting past tanning bed use, then intention to use tanning beds (see Table 3).

For past tanning bed use, the first step was significant ($F[2, 705] = 18.42$, $p \leq .001$, Adj. $R^2 = .05$). The change

TABLE 2. Standardized and Structure Coefficients for Canonical Results for Functions 1 and 2

Variable	First canonical root		Second canonical root	
	Standardized	Structure	Standardized	Structure
Personality variable				
Self-esteem	.12	.09	−.04	−.06
Sensation seeking	.32	.45	−.96	−.89
Tanning image beliefs	.90	.94	.46	.32
Risk behavior				
Smoking	.03	.20	−.36	−.50
Drinking	.32	.53	−.83	−.79
Sun risk behavior	−.41	−.71	−.23	−.20
Use of tanning bed	.16	.63	.14	.26
Intention to use tanning bed	.52	.83	.30	.29

TABLE 3. Results of Multiple Regressions Predicting Past Tanning Bed Use and Intent to Use Tanning Beds

Variable	Past tanning bed use ($n = 708$)			Intention to use tanning bed ($n = 707$)		
	B	$SE\ B$	β	B	$SE\ B$	β
Self-esteem	0.54	0.62	.03	−0.01	0.08	−.01
Sensation seeking	0.33	0.53	.02	0.08	0.07	.04
Tanning image beliefs	3.43	0.54	.24**	0.61	0.07	.31**
Acquaintance tanning bed use	0.13	0.04	.15**	0.02	0.01	.16**
Friends' tanning bed use	0.08	0.06	.06	0.01	0.01	.08***
Smoking	0.05	0.39	.01	0.09	0.05	.06
Drinking	1.16	0.47	.10*	0.15	0.06	.10*
Sun risk behavior	−0.59	0.40	−.06	−0.20	0.05	−.14**
Sex	4.95	0.80	.23**	0.71	0.10	.25**
Age	−0.17	0.30	−.02	−0.02	0.04	−.02

Note. For past tanning bed use, $R^2 = .22$; for intention to use tanning bed, $R^2 = .36$.
*$p < .01$. **$p < .001$. ***$p < .05$.

for the second step was significant ($F[3, 702] = 35.50$, $p \leq .001$, $\Delta R^2 = .13$). The change for the third and final step was also significant ($F[5, 697] = 10.30$, $p \leq .001$, $\Delta R^2 = .06$). The final model predicting past tanning bed use contained 4 significant variables: sex ($\beta = .23$, $p \leq .001$), tanning image beliefs ($\beta = .24$, $p \leq .001$), acquaintance tanning bed use ($\beta = .15$, $p \leq .001$), and drinking ($\beta = .10$, $p \leq .05$) and accounted for 22% of variance.

For intention to use tanning beds, the first step was significant ($F[2, 704] = 23.86$, $p \leq .001$, Adj. $R^2 = .06$). The change for the second step was significant ($F[3, 701] = 72.41$, $p \leq .001$, $\Delta R^2 = .22$). The change for the third step was also significant ($F[5, 696] = 19.48$, $p \leq .001$, $\Delta R^2 = .09$). The final model accounted for 36% of variance and contained 6 significant variables: sex ($\beta = .25$, $p \leq .001$), tanning image beliefs ($\beta = .31$, $p \leq .001$), acquaintance tanning bed use ($\beta = .16$, $p \leq .001$), friend tanning bed use

($\beta = .08$, $p \leq .05$), drinking ($\beta = .10$, $p \leq .01$), and sun risk behavior ($\beta = −.14$, $p \leq .001$).

COMMENT

The overall results demonstrate that all 3 systems predicted past tanning bed use and intention to use tanning beds. Variables from the personality system were the best predictors of tanning behavior. In particular, tanning image beliefs were the best predictor for past tanning bed use and intention to use tanning beds. Researchers[7,17] have shown that positive attitudes and beliefs related to tanning predict tanning bed use. Hillhouse et al[7] found that beliefs related to appearance are stronger predictors of tanning bed use than are beliefs related to health. Thus, future interventions to reduce tanning bed use among women may be aimed toward changing appearance-related motivations similar to some smoking campaigns targeting the aging effects of smoke.

A number of factors may explain why sensation seeking did not predict tanning behavior. We found a positive association between intention to tan and sensation seeking, but sensation seeking was not a predictor of intention to tan or tanning bed use when we included the other systems. Some adolescents may not understand or believe in risks associated with tanning bed use and thus may not perceive tanning bed use as something that will satisfy their needs for sensation. However, the association between intention to tan and sensation seeking could be driven by other motives, such as fascination with images of tanned celebrities or the desire to appear more exotic, that are beyond the scope of this study.

Acquaintance tanning bed use was a strong predictor of both past tanning bed use and intention to use tanning beds. Friend tanning bed use was a strong predictor of intention to use tanning beds. These findings suggest that perception of known others' use is a strong predictor for past use and intention to use tanning beds, which are consistent with prior studies.[5,26] Participants in a study by Murray and Turner[5] reported using tanning beds to enhance physical appearance, despite knowledge of the associated risks. Branstrom et al[26] concluded that some tanning behavior is normative and that perception of other people's tanning behavior may be a strong predictor of self-tanning behavior and vacation to sunny resorts (for the purpose of tanning).

The second-best predictor of past use and intention to use tanning beds was acquaintance tanning bed use. These findings are consistent with studies demonstrating links between adolescents' behavior and the behavior of their friends and acquaintances.[27] With research suggesting that tanning behavior may be influenced by social norms, health practitioners should examine normative messages and interventions to reduce tanning bed use.

Variables in behavior systems also play an important role in adolescents' tanning behavior, with a clear link between engagement in some risk behaviors but not others. Smoking and drinking were correlated with both use of and intention to use tanning beds. This may be explained by the fact that many adolescents associate smoking with a cool image.[28] Likewise, adolescents perceive alcohol consumption as an adult activity, symbolizing looking grown up.[29] In the same way, because appearance motivation heavily influences tanning behavior,[7] young people may tan, smoke, and drink to appear more sexually attractive.

In general, our findings demonstrate that each system of problem behavior theory is only one factor that may influence adolescents' decisions about tanning. Our findings support the study's theoretical framework, which we based on the premise that engagement in risk behavior is predicted by a combination of variables from all 3 systems.

Limitations

A primary caveat of this study is the use of self-reports. Future researchers may want to directly observe participants' behavior or consider their friends' and families' reports. In addition, investigators could benefit from using qualitative methods (such as in-depth interviews and focus groups) that may provide a more complete picture of relations between tanning behavior and personality, environmental, and behavior systems.

Another limitation is the generalizability to different populations and risk behaviors other than those we studied. Because we included only college students from a single campus, participants were a fairly homogeneous group in terms of age and educational level. However, college students commonly use tanning beds6 and are thus an important audience for health interventions. Furthermore, we focused on a limited number of health-risk behaviors that are by no means exhaustive. To test the generalizability of our findings, investigators should replicate our study design among more diverse sample groups in different geographical regions. Researchers should conduct larger-scale studies on multiple campuses.

Implications

Theoretically, our findings demonstrate the importance of studying tanning behavior from a multidimensional perspective. From a practical perspective, our findings may contribute to the construction of future health-intervention campaigns designed to reduce tanning bed use. The results suggest that perhaps the best strategy to affect tanning bed use is to focus on variables relevant to the positive perception of tanning. To reduce adolescents' use of and intention to use tanning beds, appearance-related campaigns must be more effective than health-risk-related campaigns.[26] In addition, because of the possible effect of perceived approval by others (friends and acquaintances), interventions focusing on the normative influence of social networks may be effective in reducing tanning bed use.

NOTE

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Journals

1. Engwal D, Hunter R, Steinberg M. Gambling and other risk behaviors on university campuses. *J Am Coll Health.* 2004;52: 245–255.

Books

2. Bernstein TM. *The Careful Writer: A Modern Guide to English Usage.* New York: Atheneum; 1965.

Other

Citations for data on a Web site should take this form: Health Care Financing Administration. 1996 statistics at a glance. http://www.hcfa.gov/stats/stathili.htm. Accessed December 2, 1996.

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