

RESEARCH REPORT

Sexual assault among North Carolina women: prevalence and health risk factors

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Study objective: Sexual assault is traumatic at the time it occurs, but it also may have longlasting negative effects on physical health. Much of the research linking specific health problems to sexual assault victimisation has used samples from special populations. The goals of this study are to estimate the prevalence of sexual assault in a representative sample of women in North Carolina and examine sexual assault in relation to specific health risk factors for leading causes of morbidity and mortality in women.

Design: The North Carolina Behavioral Risk Factor Surveillance System (BRFSS) is a household telephone survey of non-institutionalised adults, 18 years of age and older, conducted by random digit dialling.

Setting: This investigation focuses on the study participants in the 1997 survey.

Participants: The sample includes 2109 women who responded to the sexual assault questions in the 1997 North Carolina BRFSS interview.

Main results: The lifetime prevalence of sexual assault was 19% (95% CI 17% to 20%), of which 73% of victims experienced or were threatened with forced sexual intercourse. Sexual assault victims, particularly victims of forced intercourse or the threat thereof, were more likely to perceive their general health as being fair or poor (OR=2.3, 95% CI 1.5 to 3.4) and were more likely to have suffered poor physical and mental health in the past month (poor physical health, OR=2.1, 95% CI 1.6 to 2.8; poor mental health, OR= 2.6, 95% CI 1.9 to 3.5). After controlling for sociodemographic factors and health care coverage, victims of forced intercourse or the threat thereof were more likely to smoke cigarettes (OR=2.0, 95% CI 1.4 to 2.8), to have hypertension (OR=1.5, 95% CI 1.1 to 2.2), to have high cholesterol (OR=1.7, 95% CI 1.2 to 2.5), and to be obese (OR=1.7, 95% CI 1.3 to 2.4).

Conclusions: This study shows associations between sexual victimisation and health risk factors in a non-clinical statewide population of women. Future research should determine whether clinically screening for and identifying a history of sexual victimisation among women seen in a variety of health care settings leads to the initiation of effective interventions that help women successfully cope with these violent experiences. There is also a need for further research to investigate the temporal sequence of assaults and subsequent health outcomes by assessing physical health status before and after victimisation.

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Sexual assault of women is a serious public health problem that is pervasive within the United States. Prevalence estimates vary widely depending on the definition used (for example, legal definitions of rape; forced anal, oral, or vaginal penetration; any unwanted sexual contact; etc) and the population sampled. The lifetime prevalence of sexual abuse is estimated at 7% in crime statistics,¹ 5%–28% in community samples,^{2–4} and 32%–57% in clinical samples.^{5,6} Estimates of the prevalence of childhood sexual abuse range from 27% in a national sample⁷ to 37% from a clinical sample.³ Prevalence estimates of sexual assault in women that occurred only in adulthood range from 10% to 50%, with estimates in clinical samples^{5,8,9} higher than those in community samples.^{1,3} Although these estimates vary, taken together, they indicate that sexual assault is not a rare occurrence in women's lives.

There is evidence that the prevalence of violent victimisation decreases as women get older, with girls under the age of 18 having the highest prevalence.^{2,8} Almost two thirds of sexual assault victims in the US are girls under 16 years of age,¹⁰ who make up less than a quarter of the female population.¹¹ Among adults, women under age 40 have a higher prevalence of sexual assault than older women.³

Long term health sequelae may be associated with sexual assault regardless of whether the assault occurred during childhood or in adulthood. For instance, some research has

found sexual assault to be associated with sexually transmitted diseases and gynaecological problems in adult women,^{12–17} even when the abuse occurred in childhood.¹⁸ Moreover, some studies suggest that women with a history of childhood or adult sexual victimisation are more likely than non-victims to experience a lower health related quality of life,¹⁹ to report more physical symptoms,^{9,12,16,19–22} and to perceive their health status as being poor.^{16,20,23,24}

Several studies have reported that victims of sexual assault seek medical care, or are hospitalised, more frequently than non-victims.^{5,16,21,22,25,26} Koss *et al*²⁴ found that the number of physician visits by rape victims increased in both the first and second years after the rape, compared with the two years before the rape. However, in a study of primary care patients in a managed care setting, no association was found between medical utilisation and childhood sexual assault, other than an increase in the number of ongoing prescriptions.⁸

Clinically based investigations have reported a greater likelihood of sexual assault victims to engage in unhealthy behaviours such as alcoholism, illicit drug use, cigarette smoking, and sedentary lifestyle, both among adult victims²⁴ and child victims.^{9,25} Primary health care patients with a history of childhood sexual abuse also are more likely to suffer from obesity.^{25,27} Two studies^{28,29} that examined the relation between various adverse childhood experiences (including sexual abuse) and adult health status in female patients found

positive associations between the number of adverse childhood experiences and health risks such as alcoholism, drug misuse, poor self rated health, and obesity. Felitti *et al*²⁸ also reported a link between severity of adverse childhood experiences and the incidence of smoking, physical inactivity, ischaemic heart disease, cancer, chronic lung disease, skeletal fractures, and liver disease.

Much of the research linking specific health problems to sexual assault victimisation has used samples from special populations, particularly patient populations. None the less, a few studies have looked at non-patient populations. Golding, in particular, has examined community samples of women with and without histories of sexual assault in relation to various indicators of health. In one study,²⁹ she found that sexually assaulted women were less likely than non-victims to perceive their health as excellent and were more likely to experience medically explained somatic symptoms. In addition, a history of sexual assault was associated with having a physical disability, diabetes, and arthritis, but not with hypertension, heart disease, or respiratory disease. In another study, Golding found that headaches were more common among women sexually assaulted in childhood than among women who had been assaulted only as adults.³⁰ One limitation of these studies is the assessment of sexual assault, as the definition does not differentiate between sexual assault with and without forced penetration.

The goal of this study is to extend the previous research by examining lifetime prevalence of sexual victimisation in a non-clinical sample drawn from a statewide population. In particular, sexual assault is examined in relation to specific health indices that are known risk factors for leading causes of women's morbidity and mortality. The analysis accounts for potential severity of victimisation by distinguishing between sexual assault with and without forced intercourse. The following study questions are investigated:

- (1) What proportion of women living in North Carolina during 1997 had been victims of sexual assault or the threat thereof (including forced sexual intercourse and other types of sexual assault) at some point during their lifetimes?
- (2) Is a history of sexual victimisation related to a woman's perceived health status?
- (3) Is a history of sexual victimisation related to health risk behaviours among women, including excessive alcohol use and cigarette smoking?
- (4) Is a history of sexual victimisation related to specific health risk factors experienced by women, such as hypertension, high cholesterol, obesity, and diabetes?

METHODS

This investigation uses data from the Behavioral Risk Factor Surveillance System (BRFSS) funded by the Centers for Disease Control and Prevention (CDC). Several states, including North Carolina, have implemented BRFSS as an ongoing survey focused on the behavioural health of the general adult population. It is a household telephone survey of non-institutionalised adults, 18 years of age and older, conducted by random digit dialling. The main focus of the survey is to collect information concerning a variety of behavioural risk factors, health status factors, and health care utilisation factors. Although the core BRFSS questions for recent surveys have not focused on sexual violence, several participating states, including North Carolina, have supplemented the core questions by adding state specific questions concerning sexual violence. This investigation focuses on the female North Carolina BRFSS study participants during the 1997 survey.

The sample consists of the 2109 women (96% of those surveyed) who responded to the sexual assault questions in the 1997 NC BRFSS survey (see appendix 1). Before the interview began, the participants were told that their responses would be confidential. The two survey questions assessing the

participants' experiences of sexual assault, which were the last questions asked, were preceded by a brief introduction. The introduction acknowledged the sensitivity of the questions, reiterated that the responses were confidential, and framed the context of the questions with regard to the timing of the assault and the relation of the perpetrator to the respondent. The first question asked participants whether anyone had ever forced them, or tried to force them, to engage in unwanted sexual activity. The second question asked if the unwanted sexual activity was forced sexual intercourse (defined as forced vaginal, anal, and/or oral penetration, including incidents in which the penetration is from an object, such as a bottle).

For analysis purposes, each study participant was classified into one of three groups, dependent upon their responses to the two sexual assault questions:

- (1) the "no sexual assault group" was defined as those who reported that they had never been sexually assaulted (those who responded "no" to the first question);
- (2) the "threat or experience of sexual assault without forced intercourse group" was defined as those who responded "yes" to the first question and "no" to the second question; and
- (3) the "threat or experience of sexual assault with forced intercourse group" was defined as those who responded "yes" to both of the sexual assault questions.

Sociodemographic data were gathered regarding each participant's race, age, education level, employment status, marital status, annual household income, and health insurance status (health care coverage).

The health related variables in this study included:

- (1) the respondents' opinions concerning their overall health status;
- (2) whether the respondents suffered from poor physical or mental health for at least one day in the past month;
- (3) whether respondents had used alcohol in the past month or currently smoked cigarettes;
- (4) whether respondents had been told by a health professional that they had the following health risk factors: hypertension, high cholesterol, or diabetes; and
- (5) whether respondents were obese, defined as weighing more than 120% of the recommended weight for their height.

Analysis

The prevalence of overall sexual assault, as well as the prevalence of each type of sexual assault (that is, sexual assault with and without forced intercourse or the threat thereof), was estimated along with the corresponding 95% confidence intervals (95% CI).

Bivariate analyses consisting of crude odds ratios (ORs) and 95% CIs were used to examine the study participants' experiences of sexual assault in relation to their sociodemographic characteristics, their perceived health status, their alcohol use and smoking, and their health risk factors. Logistic regression analysis was used to model each of the health outcomes as a function of sexual assault victimisation and sociodemographic factors (age, education, employment status, marital status, and health care coverage). Race and income were dropped from the final models as they did not confound the relation between victimisation experience and the health outcomes. Sexual assault victimisation was coded as indicator variables with "no sexual assault experience" as the referent. Results are presented as adjusted prevalence ORs and 95% CI representing the odds of a sexual assault victim experiencing the health outcome compared with the odds of a non-victim experiencing the health outcome, adjusted for the sociodemographic factors. All calculations were performed using the SUDAAN software package³¹ to account for the sampling procedure.

Table 1 Crude odds ratios for sociodemographic characteristics of study participants by sexual assault experience, North Carolina, 1997

	No sexual assault n=1719	Threat/sexual assault without intercourse n=105		Threat/sexual assault with intercourse n=285	
	%	%	OR (95% CI)	%	OR (95% CI)
Age (y)					
18–29	20	20	3.1 (1.3 to 7.6)	34	9.7 (5.5 to 16.9)
30–39	18	30	5.3 (2.3 to 12.2)	29	9.3 (5.4 to 16.0)
40–49	19	26	4.3 (1.8 to 9.9)	22	6.6 (3.8 to 11.6)
50–59	13	14	3.2 (1.2 to 8.3)	10	4.1 (2.1 to 7.8)
60+	30	10	1.0 (referent)	5	1.0 (referent)
Marital status					
Married or unmarried w/ partner	62	70	1.0 (referent)	52	1.0 (referent)
Divorced/separated	10	15	1.3 (0.73 to 2.4)	22	2.6 (1.9 to 3.6)
Widowed	14	6	0.38 (0.17 to 0.84)	4	0.32 (0.18 to 0.57)
Never married	14	8	0.54 (0.25 to 1.2)	22	1.9 (1.3 to 2.7)
Education					
<High school graduate	22	9	0.22 (0.10 to 0.49)	14	0.52 (0.34 to 0.82)
High school graduate/some college	58	54	0.50 (0.31 to 0.80)	61	0.86 (0.62 to 1.2)
College graduate	20	38	1.0 (referent)	25	1.0 (referent)
Employed	52	76	2.8 (1.8 to 4.8)	65	1.7 (1.3 to 2.2)
18–29 years			1.4 (0.45 to 4.3)		0.96 (0.55 to 1.7)
30–39 years			1.6 (0.63 to 4.3)		0.68 (0.40 to 1.1)
40–49 years			1.3 (0.43 to 4.2)		0.87 (0.45 to 1.7)
50–59 years			2.7 (0.64 to 11.1)		1.4 (0.56 to 3.6)
60+ years			4.8 (0.88 to 25.0)		2.7 (0.85 to 8.3)
Health care coverage	90	89	0.91 (0.48 to 1.9)	78	0.42 (0.28 to 0.59)
Race					
White	77	78	1.0 (referent)	74	1.0 (referent)
Black	20	18	0.87 (0.49 to 1.6)	23	1.2 (0.87 to 1.6)
Other	3	5	2.1 (0.50 to 9.0)	4	1.3 (0.56 to 2.9)
Annual income					
<\$15000	16	11	0.41 (0.20 to 0.84)	17	1.2 (0.74 to 2.0)
\$15000–\$24999	26	20	0.46 (0.23 to 0.88)	26	1.1 (0.71 to 1.8)
\$25000–\$49999	37	33	0.53 (0.30 to 0.91)	39	1.2 (0.79 to 1.8)
\$50000+	20	35	1.0 (referent)	18	1.0 (referent)

Note: Some column percentages may not total 100% because of rounding.

RESULTS

Prevalence of sexual assault

The prevalence of history of sexual assault among women in North Carolina was estimated to be 19% (95% CI 17% to 20%). Examination of the type of sexual assault found that threat or experience of sexual assault with forced intercourse was more prevalent than was threat or experience of sexual assault without forced intercourse, 14% (95% CI 12% to 15%) and 5% (95% CI 4% to 6%), respectively. Thus, forced intercourse or the threat thereof was involved in 73% of sexual assault histories.

Sexual assault and sociodemographic characteristics

Examination of the sociodemographic characteristics of the study participants by their sexual assault experiences detected several differences between the groups (table 1). Sexual assault victims were more likely than non-victims to be younger. The mean ages in this sample were 48 years for non-victims, 41 years for respondents reporting threat or experience of sexual assault without intercourse, and 37 years for those who reported a history of threat or experience of forced intercourse. Moreover, the odds of a respondent who was threatened with or experienced forced intercourse being under 40 years of age was more than nine times the odds of a non-victim being less than 40 years old.

Sexual assault victims were also more likely than non-victims to be separated or divorced, less likely to be widowed, more likely to be a college graduate, and more likely to be employed. When the association between employment and sexual victimisation was stratified by age, women younger than 50 years old who reported a history of threat or experience of forced intercourse were slightly less likely than non-victims to be employed. Although sexual assault victims were more likely to be employed than non-victims, they were

less likely to have any type of health care coverage. Moreover, of those participants with health care coverage, victims who experienced forced intercourse or the threat thereof were more likely to be on Medicaid than were women in the other two groups (OR=3.2, 95% CI 1.8 to 5.7). Race was not materially associated with sexual assault experiences in this sample.

Interestingly, no relation was seen between income and threat or experience of sexual assault with forced intercourse. Given the strong association between age and history of sexual assault seen in these data, a stratified analysis was performed to control for age (table 2). In women younger than 40 years old, the odds of reporting an annual household income of less than \$25 000 is at least two times greater in participants who were threatened with or experienced forced intercourse than in nonvictims. Conversely, women 60 years or older who were threatened with or experienced forced intercourse were less likely than non-victims to report an annual household income of less than \$25 000. Because of the high level of missing data (22%), income was not included in any further analyses.

Sexual assault and health outcomes

The findings of the bivariate analyses of sexual assault experiences and health outcomes in women suggest that both groups of sexual assault victims were more likely to experience poor physical and mental health in the past month, to consume alcohol, and to smoke cigarettes (table 3). Compared with the other two groups, victims of threat or experience of sexual assault without intercourse were the least likely to perceive their general health as fair or poor, to be obese, to have diabetes, or to have one or more of the four health risk factors. Conversely, victims of threat or experience

Table 2 Odds ratios for income level of study participants by sexual assault experience stratified by age, North Carolina, 1997

	Threat/sexual assault without intercourse OR (95% CI)	Threat/sexual assault with Intercourse OR (95% CI)
18–29 years:		
<\$15000	0.62 (0.09 to 4.4)	2.7 (0.94 to 7.9)
\$15000–\$24999	0.72 (0.17 to 3.1)	2.0 (0.75 to 5.1)
\$25000–\$49999	0.60 (0.15 to 2.4)	1.0 (0.40 to 2.7)
\$50000+	1.0 (referent)	1.0 (referent)
30–39 years:		
<\$15000	0.66 (0.17 to 2.6)	2.6 (0.96 to 6.8)
\$15000–\$24999	0.41 (0.13 to 1.3)	2.1 (0.89 to 5.1)
\$25000–\$49999	0.48 (0.17 to 1.3)	1.8 (0.81 to 4.1)
\$50000+	1.0 (referent)	1.0 (referent)
40–49 years:		
<\$15000	0.47 (0.06 to 3.9)	1.9 (0.74 to 5.0)
\$15000–\$24999	0.62 (0.16 to 2.4)	0.91 (0.35 to 2.4)
\$25000–\$49999	0.60 (0.23 to 1.5)	1.3 (0.62 to 2.9)
\$50000+	1.0 (referent)	1.0 (referent)
50–59 years:		
<\$15000	0.96 (0.21 to 4.3)	1.0 (0.29 to 3.7)
\$15000–\$24999	0.38 (0.04 to 3.5)	0.73 (0.21 to 2.6)
\$25000–\$49999	0.64 (0.14 to 2.9)	0.94 (0.30 to 2.9)
\$50000+	1.0 (referent)	1.0 (referent)
60+ years:		
<\$15000	0.40 (0.04 to 4.3)	0.30 (0.05 to 1.8)
\$15000–\$24999	0.67 (0.06 to 7.7)	0.22 (0.03 to 1.5)
\$25000–\$49999	0.69 (0.07 to 7.1)	0.90 (0.16 to 5.2)
\$50000+	1.0 (referent)	1.0 (referent)

Table 3 Crude odds ratios for health outcomes of study participants by sexual assault experience, North Carolina, 1997

	No sexual assault n=1719	Threat/sexual assault without intercourse n=105		Threat/sexual assault with intercourse n=285	
	%	%	OR (95% CI)	%	OR (95% CI)
Perceived health status					
Fair/poor general health	18	13	0.67 (0.37 to 1.2)	20	1.2 (0.83 to 1.6)
Poor physical health in past month	28	43	1.9 (1.2 to 2.9)	47	2.2 (1.7 to 3.0)
Poor mental health in past month	22	44	2.7 (1.7 to 4.3)	50	3.4 (2.6 to 4.5)
Health behaviours					
Drank alcohol in past month	27	43	2.0 (1.3 to 3.2)	39	1.7 (1.3 to 2.3)
Current smoker	20	25	1.4 (0.83 to 2.3)	38	2.6 (1.9 to 3.4)
Health risk factors					
Hypertension	26	22	0.82 (0.49 to 1.4)	23	0.84 (0.61 to 1.2)
High cholesterol	27	28	1.0 (0.60 to 1.7)	30	1.2 (0.82 to 1.6)
Obesity	33	27	0.74 (0.46 to 1.2)	42	1.4 (1.1 to 1.9)
Diabetes	6	3	0.55 (0.19 to 1.6)	4	0.66 (0.36 to 1.2)
One or more of above health risk factors	54	45	0.68 (0.44 to 1.1)	58	1.2 (0.90 to 1.6)

of forced intercourse were most likely to be obese and to experience one or more of the health risk factors.

Table 4 presents the results of the logistic regression analyses that controlled for sociodemographic characteristics and health care coverage. Adjusted OR estimates are shown for the various health outcomes (perceived health status, etc) by the study participants' experiences of sexual assault. The odds of a victim of threat or experience of forced intercourse perceiving her general health as being fair or poor was about twice that of a non-victim, whereas, threat or experience of sexual assault without intercourse was only weakly associated with the perception of fair or poor general health. Both types of sexual assault victimisation were moderately associated with a participant's report of having suffered from poor physical or mental health in the past month compared with no sexual assault victimisation.

Alcohol use within the past month was not strongly related to sexual assault victimisation. This was also true when an

analysis of the mean number of drinks consumed in the past month was examined among women who drank: no sexual assault, mean=6.6 (SD=0.41); threat or experience of sexual assault without intercourse, mean=8.4 (SD=1.3); threat or experience of forced intercourse, mean=6.6 (SD=0.89). Cigarette smoking was moderately associated with threat or experience of forced intercourse and weakly associated with threat or experience of sexual assault without intercourse.

The logistic regression analyses found no material associations between any of the four health conditions and being a victim of threat or experience of sexual assault without intercourse. In contrast, victims of threat or experience of forced intercourse were more likely to have hypertension, high cholesterol, and to be obese. Although positive, the association between diabetes and threat or experience of forced intercourse was weak. Lastly, victims of threat or experience of forced intercourse were more likely than women in either of

Table 4 Adjusted odds ratios for health outcomes of study participants by sexual assault experience, North Carolina, 1997*

	Threat/sexual assault without intercourse OR (95% CI)	Threat/sexual assault with intercourse OR (95% CI)
Perceived health status		
Fair/poor general health	1.4 (0.75 to 2.7)	2.3 (1.5 to 3.4)
Poor physical health in past month	2.1 (1.3 to 3.3)	2.1 (1.6 to 2.8)
Poor mental health in past month	2.4 (1.5 to 3.7)	2.6 (1.9 to 3.5)
Health behaviours		
Drank alcohol in past month	1.5 (0.92 to 2.6)	1.3 (0.93 to 1.7)
Current smoker	1.5 (0.87 to 2.5)	2.0 (1.4 to 2.8)
Health risk factors		
Hypertension	1.3 (0.70 to 2.4)	1.5 (1.1 to 2.2)
High cholesterol	1.3 (0.73 to 2.4)	1.7 (1.2 to 2.5)
Obesity	0.88 (0.53 to 1.5)	1.7 (1.3 to 2.4)
Diabetes	1.0 (0.32 to 3.2)	1.4 (0.75 to 2.8)
One or more of above health risk factors	0.94 (0.57 to 1.6)	1.9 (1.4 to 2.5)

*Sample sizes for the logistic regression models range from 1621 to 2076 depending on missing data for the model variables. The reference group is the no sexual assault group. ORs are adjusted for *age (years)*: 18–39, 40–49, 50–59, 60+ (ref); *education*: <high school graduate, high school graduate/some college, college graduate (ref); *employment*: no, yes (ref); *marital status*: divorced or separated, widowed, never married, married or unmarried with partner (ref); and *health care coverage*: no, yes (ref).

Key points and policy implications

- Sexual assault is not a rare occurrence in women's lives.
- Sexual assault victims were more likely to report having suffered from poor physical or mental health in the past month compared with non-victims.
- Women who were threatened with or experienced forced intercourse were more likely to experience one or more health risk factors, particularly hypertension, high cholesterol, and obesity.
- The effectiveness of health care policies mandating the screening of female patients for violence victimisation, including sexual assault, should be evaluated, with attention paid to whether the identification of such experiences in women's lives leads to the implementation of interventions that improve the health and wellbeing of women.

the other two groups to experience one or more of the four health risk factors.

DISCUSSION

This research is unique in being the first investigation that has studied a statewide representative sample of women in North Carolina to examine the lifetime prevalence of sexual assault and its relation with health risk factors. Almost 19% of the women in this study reported being the victim of some type of sexual assault during their lifetimes, and about three quarters of the victims experienced forced intercourse or the threat thereof. This prevalence is slightly lower than other population-based estimates from other geographical areas, although the proportion of sexually victimised women reporting threat or experience of forced intercourse (73%) is higher than the 50% estimate reported in a community study that used a broader definition of sexual assault.³

These findings must be viewed in light of the methodological constraints of this study, the first being that the study data were drawn from telephone interviews with the study participants. The information is open to reporting bias, especially given the potentially sensitive nature of the topic. Furthermore, the preface to the sexual assault questions in the interview lacked clarity regarding sexual assault by family members. Some women may not have reported childhood sexual abuse by a family member as a sexual assault. In addition, there probably was a sampling bias that is inherent in studies that use random digit dialling. Women with a lower

socioeconomic status—that is, those without phones—were excluded from the study. Thus, it is likely that the estimates presented here actually underestimate the true extent of sexual violence experienced by women in North Carolina.

In this sample, age was strongly associated with sexual assault experience. For example, the greatest proportion of non-victims (30%) was in the oldest age group, those aged 60 years or older, whereas the greatest proportion of victims (34%) was in the youngest age group, those aged 18–29 years. This may represent recall or response bias wherein older women may not remember or may not choose to disclose sexual assault that occurred when they were younger. This could have resulted in some misclassification of victims as non-victims and may have attenuated associations with the health risk factors. Alternatively, the age differential may reflect a survival bias in favour of non-victims. For example, some victims of sexual violence are also victims of homicide³² and possibly suicide.³³ Moreover, those who survive violent victimisation and experience physical and emotional sequelae because of it may die at a younger age. A third explanation for the age disparity may be that the data reflect a cohort or period effect (that is, a lower incidence of sexual assault 50–60 years ago).

Another limitation of this study is the inability to assess the temporal sequence of the sexual victimisation and the development of the health risk factors. The 1997 NC BRFS survey did not ask participants when they were sexually assaulted, so it cannot be determined if the assault occurred before or after the health problems developed. Other research suggests that childhood sexual abuse is more common than adult sexual abuse.^{2, 8–10} Moreover, Leserman *et al*²¹ found no difference in health status among female patients who had experienced childhood sexual abuse and those who were sexually assaulted as adults. None the less, the health problems found here may have existed before the victims were sexually assaulted.

In this study, victims who were threatened with or experienced forced intercourse, but not those sexually assaulted without intercourse, were more likely than non-victims to have hypertension, to have high cholesterol, to be obese, and to smoke cigarettes. All of these health problems are established risk factors for leading causes of morbidity and mortality in women, for example, coronary heart disease.³⁴ These risk factors are modifiable by lifestyle changes, such as smoking cessation, dietary changes, increased exercise, and weight loss. However, it is not clear if advising women with histories of sexual violence to make lifestyle changes will be

Appendix 1
North Carolina BRFSS Sexual Assault Questions
(1997)

Module NC-5: Rape/Sexual Assault

1. Incidents involving forced or unwanted sexual acts are often difficult to talk about. The next question may be hard for you to answer, but the confidential information that you and other survey respondents provide is very important for prevention and education programs. The question refers to incidents occurring during childhood and/or during adulthood, and it may include events involving acquaintances, people you knew well, and/or strangers.

	Keeping these things in mind, has anyone ever forced or tried to force you to engage in unwanted sexual activity?	(362)
Include incidents involving intimates, acquaintances, and/or strangers, and incidents occurring in childhood and/or adulthood	a. Yes	1
	b. No Go to Closing Statement	2
	Don't know/Not sure Go to Closing Statement	7
	Refused Go to Closing Statement	9

2. Do you mean forced sexual intercourse? (363)

	a. Yes	1
Sexual intercourse means vaginal, anal, and/or oral penetration by the offender. This category also includes incidents where the penetration is from a foreign object such as a bottle.	b. No	2
	Don't know/Not sure	7
	Refused	9

effective. Two studies of clinical populations suggest that obesity may be “adaptive” in victims of sexual abuse. In Felitti’s case-control study of obese adults in a weight loss programme,²⁷ obese patients were more likely to report a history of sexual abuse than non-obese patients. In addition, the obese patients reported that they used their obesity as a protective mechanism against further sexual activity, and they used overeating as a coping mechanism for emotional distress. Wiederman *et al*³⁵ found no association between sexual abuse and obesity in their sample of primary care patients, but did report an interaction between sexual abuse and obesity in predicting body dissatisfaction in adult women. Victims of sexual abuse who were obese reported less dissatisfaction with their body compared with obese non-victims. Given these findings, more research is needed to determine if sexually abused women engage in risky lifestyle behaviours as a means of coping with their trauma. Furthermore, research must examine whether they are reluctant to change risky behaviours without first tackling the underlying trauma.

There is a growing body of literature suggesting that violence against women may have long term health effects. This study shows associations between sexual victimisation and health risk factors in a non-clinical statewide population of women. Future research should determine whether clinically screening for and identifying a history of sexual victimisation among women seen in a variety of health care settings leads to the initiation of effective interventions that help women successfully cope with these violent experiences. There is also a need for further research to investigate the temporal sequencing of assaults and subsequent health outcomes by assessing physical health status before and after victimisation. Furthermore, a better understanding of the nature of sexual victimisation (for example, when it occurred,

severity, victim-offender relationship, chronic revictimisation, etc) will allow a more comprehensive analysis of a causal link between violent victimisation and negative health effects. Tackling this complex problem requires the development of sensitive, rigorous, and longitudinal research methods to study violence and its impact on the lives of women.

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