Knowledge and Beliefs Related to Cervical Cancer and Screening Among Korean American Women

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Abstract

The purpose of this article is to examine knowledge and health beliefs associated with cervical cancer screening among Korean American women. A telephone survey was conducted with 189 Korean American women in the Chicago area. Age, marital status, income, knowledge of early detection method for cervical cancer, and perceived beliefs about benefits of and barriers to receiving Pap tests were all related to outcomes of ever having a Pap test and having had one in the preceding 3 years. Variables uniquely related to ever having a Pap test were education, employment status, fluency in English, and proportion of life spent in the United States. Variables uniquely related to having had the test during the preceding 3 years were having a usual source of care and regular checkups. Different intervention components are suggested for the groups of Korean American women who have never had a Pap smear and for those who have not had one in the preceding 3 years, in addition to common intervention strategies that aim to increase knowledge and perceived benefit and to decrease perceived barriers to receiving Pap tests.

Keywords

cervical cancer; screening behaviors; health behavior; symptom focus; Korean Americans; Pap smear; knowledge; beliefs

Asian American women, including Korean American women, have much lower cervical cancer screening and early detection rates than do non-Hispanic White women in the United States (Kagawa-Singer & Pourat, 2000). In contrast to the 84% of all women aged 18 years or older in the United States who have had a Papanicolaou test (Pap test) in the past 3 years (Coughlin, Uhler, Hall, & Briss, 2004), only 26% to 36% of Korean American women have received such a test in past 3 years (Centers for Disease Control and Prevention, 2004; K. Kim et al., 1999; Wismer et al., 1998); only 41% to 52% have had one in the past 2 years (Juon, Seung-Lee, & Klassen, 2003; Maxwell, Bastani, & Warda, 2000; Wismer et al., 1998); and anywhere from 22% to 75% of Korean American women had ever had one in their entire lives (Centers for Disease Control & Prevention, 2004; Juon et al., 2003; K. Kim et al., 1999; Sarna, Tae, Kim, Brecht, & Maxwell, 2001; Wismer et al., 1998). The Pap test rates among Korean American women are consistently far below the Healthy People 2010 goal (U.S. Department of Health and Human Services, 2000)—namely, that 97% of women aged 18 years and older will have received a Pap test in their lives and that 90% will have received Pap tests during the preceding 3 years.

Early cervical cancer detection through Pap testing is critical to reducing cervical cancer–related morbidity and mortality. The U.S. Preventive Services Task Force (2003) recommends cervical cancer screening at least every 3 years for women who have an intact cervix. Studies with Korean American women regarding their cervical cancer screening behaviors have identified several contextual factors: sociodemographic status, including age, employment, marital status, and income; acculturation levels, including years in the United States and spoken-English proficiency; health care access issues, such as health insurance and the physician's ethnicity and gender, as well as ever having had a checkup and having a physician's recommendation; and social support issues, such as having friends or family members who receive Pap tests (Juon et al., 2003; K. Kim et al., 1999; M. C. Lee, 2000; Lew et al., 2003; Maxwell et al., 2000; Sohn & Harada, 2005).

Notwithstanding sociodemographic factors, Korean American women have low levels of knowledge, and their knowledge is related to whether they receive cervical cancer screening (Juon, Seo, & Kim, 2002; Juon et al., 2003; K. Kim et al., 1999). Women who are knowledgeable about screening guidelines are 3 times more likely to report regular Pap smear (Juon et al., 2003). Findings from two published articles about studies using focus groups suggest that Korean American women have misconceptions about cervical cancer etiology, preventive strategies, and early detection methods (H. Kim, Lee, Lee, and Kim, 2004; M. C. Lee, 2000), such as the belief that a hysterectomy would prevent cervical cancer (M. C. Lee, 2000).

The health belief model (HBM) has been used extensively and successfully to explain and predict breast cancer screening behavior and various other health promotion behaviors, but it has been rarely used in cervical cancer screening research, either for KAs or for American women overall. Perceived susceptibility to developing a disease, seriousness of the disease, benefits of taking action to prevent the disease, and barriers to taking the action (collectively referred to as *beliefs*), knowledge, and sociodemographic characteristics compose the HBM constructs (Janz, Champion, & Strecher, 2002). In addition, several studies have identified culture-specific beliefs related to cervical cancer screening—for example, that not having symptoms or health problems means that screening is unnecessary (Juon et al., 2003; K. Kim et al., 1999).

The purpose of this article is to identify factors based on the HBM (sociodemographic characteristics, knowledge, and beliefs) that are related to receiving cervical cancer screening services (obtaining Pap testing) among Korean American women residing in Cook County, Illinois. In the current study, cervical cancer screening is the behavior of interest: specifically, the use of Pap tests ever and during the preceding 3 years. The reason for examining the outcome of ever having a Pap test is that unlike women in the United States in general, only 22% to 75% of Korean American women have ever had a Pap test in their lives (as discussed earlier). In the United States, almost every woman has had a Pap smear at some time, and approximately 83% of women with intact cervixes have had a Pap smear in the preceding 3 years (Solomon, Breen, & McNeel, 2007). This finding suggests that Korean American women who have never had a Pap smear might be different from those who have had a Pap smear in terms of sociodemographics, knowledge, and beliefs. Furthermore, the U.S. Preventive Services Task Force (2003) recommends cervical cancer screening at least every 3 years for women who have an intact cervix, which is why we decided to examine predictors of Korean American women's having had one test during the preceding 3 years. Results could inform intervention strategies to increase cervical cancer screening among Korean American women. This study was approved by the institutional review board at the University of Illinois–Chicago.

Method

Sample and Procedures

This cross-sectional telephone survey was conducted from December 2003 to March 2004 with 189 Korean American women. Common Korean last names of people living in Cook County, Illinois ($N = 2,200$), and their phone numbers were found from directory Web sites. Phone calls were placed to find eligible participants. Inclusion criteria were that women had to be 40 years old (or older), and they had to have been born in Korea. We included women who were at least 40 years old because this study was conducted to examine Korean American women's breast and cervical cancer screening behaviors and because routine mammogram screening is recommended only for women 40 years old and older. Of the 2,200 names, 630 people answered our phone calls, of whom 350 women (56%) were eligible to participate. Once a woman had been contacted and deemed eligible per the inclusion criteria, the study was explained, and she was invited to participate in the telephone survey. Of the 350 eligible women, 146 (42%) refused to participate, thus resulting in 204 participants. However, 15 respondents were later excluded because they did not complete the survey, thereby resulting in a final sample of 189. Verbal agreement from a participant was considered her consent to participate in the study. Further details of the sampling procedure are reported elsewhere (E. E. Lee, Fogg, & Sadler, 2006).

The telephone survey was conducted by a bilingual research assistant, and each lasted between 20 and 30 min. All telephone interviews were done in Korean because all the respondents had been born in Korea and preferred to speak Korean. Participants received a $10 gift certificate by mail as compensation for their time.

Survey Development

The survey instrument was developed in English, translated into Korean, back-translated into English, and revised as necessary. Three experts in cancer screening, survey development, and/or Korean women's health issues were consulted during survey development. The survey included questions about cervical cancer screening behaviors, sociodemographic information, and knowledge and health beliefs about cervical cancer and cancer screening.

Measures

The dependent variables measured participants' self-reported receipt of Pap tests, via two questions: "Have you ever had a Pap smear?" and "If you ever had one, when was the last time you had the Pap smear for the purpose of screening without any symptoms?"

Sociodemographics (independent variables) included age, marital status, education, employment status, household income, religion, level of acculturation (years of residence in the United States, proportion of life spent in the United States, and English-speaking ability), and health-related questions (having health insurance; having a usual source of care, such as a regular physician or place to go for health care; and having regular checkups during the previous 2 years, even when not sick).

Knowledge related to cervical cancer and cancer screening (independent variable) was measured via 15 items addressing two areas: 12 items related to risk factors of cervical cancer and 3 items related to cervical cancer screening. The items were developed based on American Cancer Society Web sites and on our previous studies with Korean American women, which tapped their culture-specific knowledge about cervical cancer and screening. For items measuring knowledge related to cervical cancer risk factors, respondents answered *yes*, *no*, or *don't know* for each risk factor. Correct answers were scored 1, and incorrect

answers and *don't know*'s were scored 0; thus, higher scores on the subscale indicate higher levels of knowledge related to cervical cancer risk factors. The 3 items measuring knowledge related to cervical cancer screening were multiple choice, and each had only one correct answer. Correct answers were scored 1, and incorrect answers were scored 0. These items differed from belief-related items in that they assessed factual knowledge versus the individuals' perceptions of cervical cancer, their risk, and screening. Cronbach's alpha for the entire 15-item Knowledge Scale, as well as for the 12-item Knowledge of Cervical Cancer Risk Factors subscale, was .73.

To measure health beliefs about cervical cancer and cancer screening (independent variable), the Health Belief Model Scale for Cervical Cancer Screening–Korean Version was developed by adapting Champion's Breast Health Survey (1993, 1999) on breast cancer screening. Items that are not relevant to cervical cancer screening were deleted, and some items were added on the basis of our previous studies with Korean American women. This instrument has 18 items and was developed to measure perceived susceptibility to cervical cancer (3 items) and perceived seriousness of cervical cancer (6 items), as well as perceived benefits of having a Pap test (4 items) and barriers to having a Pap test (5 items).

The Susceptibility subscale measures perceived chance of getting cervical cancer sometime during one's life (e.g., "My chances of getting breast cancer in the next few years are great"). The Perceived Seriousness subscale measures the consequences of having cervical cancer in both an intrapersonal and interpersonal context (e.g., "Cervical cancer would threaten a relationship with my boyfriend, husband, or partner"). Two items in the Seriousness subscale are based on our previous studies and so address beliefs among Korean American women (e.g., "If I had cervical cancer, it would disrupt the harmony in my family" and "If I had cervical cancer, my sexual ability or attractiveness would change"). The Benefits subscale measures perceived benefits of having a Pap smear (e.g., "Having a Pap smear will decrease my chances of dying from cervical cancer"). One item on the subscale was added on the basis of our previous studies (i.e., "Having a Pap smear will give me peace of mind about my health or will assure me that I am okay"). The Barrier subscale measures five perceived barriers: embarrassment, taking too much time, having other problems more important than being screened, too old to have a screening, and not having any symptoms. Four of the perceived barriers are borrowed from the Champion's Breast Health Survey (1993, 1999) on breast cancer screening; the last item, not having symptoms, was included in the measure on the basis of our previous studies.

Scoring for the Health Belief Model Scale for Cervical Cancer Screening–Korean Version is the same as for Champion's original scale (1993, 1999), using Likert-type responses from *strongly disagree* to *strongly agree*. A higher score indicates a higher level of all beliefs. Cronbach's alphas for the Susceptibility, Seriousness, Benefits, and Barriers subscales are .91, .85, .64, and .63, respectively. The moderate Cronbach's alphas for the Benefits and Barriers subscales could be attributed to the multidimensionality of the subscales.

Data Analysis

Data were analyzed using SPSS 13.0. Descriptive statistics were used to describe sample characteristics and Pap smear utilization. The data analysis was conducted in two phases: The first phase examined point-biserial correlation coefficients between the independent variables (sociodemographics, knowledge, and HBM) and outcome variables (ever having had a Pap smear and having had one in the preceding 3 years). The second phase of analysis entered the significant bivariate predictors of the outcomes into a multiple logistic regression analysis. Stepwise logistic regression analysis was conducted. Wald statistics were used to determine what variables significantly predict each of the outcome variables: ever having had a Pap test and having had a Pap test during the past 3 years. Most of the knowledge

items and income data were not included in the analyses, because of the high percentage of missing data. More than 40% of the participants chose correct answers on only two items of the Knowledge Scale, and these were included in the analysis ("Having a family history of cervical cancer is related to developing cervical cancer" and "Which of the following methods is the most effective way to detect cervical cancer at an early stage?"). Statistical differences are reported when $p < .05$.

Results

Sample Characteristics

The mean age of the participants was 60 (range = 40–90 years), and the majority were married (71%). About half the women (51%) had finished high school, and most were Christian (93%). The average length of residence in the United States was 19 years (range = 1–35 years); more than half (54%) had lived in the United States longer than 20 years; and 69% had spent more than 25% of their lives in the United States. More than half (52%) reported that they spoke little or no English. Among the participants, 77% had health insurance; 67% had a regular doctor or a place to go for health care; and 70% reported that they had received checkups or screenings without symptoms during the preceding 2 years.

Dependent Variables

Eighty-five percent ($n = 160$) of the sample reported ever having had a Pap test in their lives, and 66% ($n = 124$) had had the test during the preceding 3 years.

Independent Variables

Table 1 illustrates the results of bivariate correlation analyses regarding the influence of the independent variables on ever having had a Pap test and having had one during the preceding 3 years. Among all the independent variables, age, marital status, income, having the knowledge of early detection methods for cervical cancer, and perceived beliefs about benefits of and barriers to receiving Pap testing were significant predictors of both outcome measures of ever having had a Pap smear and having had one in the preceding 3 years. Specifically, women who were younger, married, had a household income of $55,000 or higher, knew that a Pap smear was the most appropriate way to detect cervical cancer in the early stage, and had higher levels of perceived benefits and lower levels of perceived barriers were more likely to have ever had a Pap test and to have had a Pap test in the preceding 3 years. Furthermore, education, employment, English-speaking ability, and proportion of life spent in the United States were significant predictors related to ever having had a Pap test; that is, women who had more than a high school education, were employed, spoke English well or fluently, and had lived 25% or more of their lives in the United States were more likely to have ever had a Pap test. Having a usual source of care (routine care) and receiving regular checkups in the past 2 years were significant predictors of having had a Pap test during the preceding 3 years.

In the final logistic regression model, all the significant predictors described above were included in each stepwise model. The analysis of having ever had a Pap smear included age, marital status, education, employment, English-speaking ability, proportion of life spent in the United States, income, having knowledge of the early detection method for cervical cancer, and perceived beliefs about benefits of and barriers to receiving Pap testing. In the stepwise model for ever having had a Pap test, perceived barriers and having knowledge of the early detection method were the only retained predictors (see Table 2). For those women who had higher levels of barriers, the odds ratio of ever having had a Pap test was 0.139. Thus, for those women who had lower levels of barriers, the odds suggest that they were 7 times more likely to have ever had a Pap test. Women who knew that a Pap smear is the

most appropriate method for detecting cervical cancer in the early stages had 5 times the odds of reporting ever having had a Pap test than did those women who did not know this fact (confidence intervals = 1.32, 20.49).

Similarly, the stepwise regression analysis of having had a Pap smear in the preceding 3 years included age, marital status, income, having a usual source of care, receiving regular checkups in the past 2 years, having the knowledge of the early detection method for cervical cancer, and perceived beliefs about benefits of and barriers to receiving Pap testing. The final logistic regression model included having regular checkups and perceived barriers; that is, Korean American women who received regular checkups without any symptoms in the previous 2 years had 5 times greater odds of having had a Pap test during the past 3 years (odds ratio = 5.7, confidence intervals = 2.24, 14.57). For those women who had higher levels of barriers, the odds ratio of having had one during the previous 3 years was .112. Thus, for those women who had lower levels of barriers, the odds were 9 times greater that they had a Pap test within the past 3 years.

One problem of conducting stepwise regression analysis is that it can leave out possible predictors that are collinear to predictors that are included in the model. To address this problem, a collinearity analysis was conducted, which determined that a subset of the predictor variables were correlated, with Spearman rhos between −.320 and .585. This level of collinearity is not excessive for this kind of logistic regression analysis, where most of the predictors are included in the stepwise model.

Discussion

This study analyzed knowledge and beliefs related to cervical cancer and screening and other sociodemographic factors from the HBM to understand Korean American women's cervical cancer screening behaviors. The outcome measures were as follows: having ever had a Pap test and having had one during the preceding 3 years. We found a somewhat higher participation in cervical cancer screening among Korean American women than what most other studies have found. The higher Pap test utilization rates in this study could be a reflection of Korean American women's increasing access to information and screening. Findings from a study with Korean women in Santa Clara County, California, where survey data of 1994 were compared with survey data of 2002, found that the rate of ever having had a Pap test increased from 65% to 75% and that the rate of having had a Pap test during the preceding 3 years increased from 57% to 63% (Centers for Disease Control and Prevention, 2004). However, the 85% rate of having ever had a Pap test and the 66% Pap test utilization rate during the preceding 3 years among Korean American women in this study are still far below the Healthy People 2010 national health objectives (U.S. Department of Health and Human Services, 2000)—namely, that 97% of women will have had a Pap test and that 90% of women aged 18 and older will have had a Pap test during the preceding 3 years.

No published studies have compared variables related to Korean American women's Pap smear utilization for the two outcomes of ever having had a test and having had a test in the preceding 3 years. We found that some of the independent variables were significant predictors of both outcome measures, which is consistent with findings from literature (Juon, Choi, & Kim, 2000; Juon et al., 2002; Juon et al., 2003; K. Kim et al., 1999; Wismer et al., 1998). Such variables included, for example, age, marital status, income, having knowledge of the early detection method for cervical cancer, and perceived beliefs about benefits of and barriers to receiving Pap testing. However, those variables that significantly predicted the outcome of ever having had a Pap smear indicate the strong influence of socioeconomic and acculturation levels on this behavior—variables such as education, employment, English-speaking ability, and proportion of life spent in the United States. In

the logistic analysis, women who knew that a Pap smear is the most appropriate method for detecting cervical cancer in the early stages were 5 times more likely to have had a Pap smear, which suggests that having this knowledge could be influenced by their socioeconomic and acculturation levels. In contrast, variables that were significantly related to having had a Pap smear in the preceding 3 years—such as having a usual source of care (routine care) and receiving regular checkups in the previous 2 years without symptoms— indicate that Korean American women who have access to routine care and regular checkups are more likely to receive a routine Pap smear. Therefore, different intervention components are suggested for the different groups of Korean American women, in addition to the common intervention strategies that aim to increase perceived benefits and decrease perceived barriers of receiving Pap tests. For those women who have never had a Pap smear, an intervention could incorporate providing education about cervical cancer and screening. For those women who have had a Pap smear but their screenings are not updated, the intervention could incorporate assisting and educating Korean American women in accessing the health care system and developing the habit of having routine checkups.

The concept of perceived barriers to receiving a Pap smear was a robust predictor for both outcome variables. Not much information is available in terms of the relationship between perceived barriers and Pap smear utilization behaviors among Korean American women, but perceived barriers have been found to strongly predict breast cancer screening behaviors in Koreans (Han,Williams, & Harrison, 1999, 2000; Hur, Kim, & Park, 2005; Y. W. Lee, Lee, Shin, & Song, 2004). Korean American women who have immigrated from Korea, where cervical cancer screening behavior may not have been emphasized, may retain their traditional cultural beliefs and attitudes that prevent them from receiving cervical cancer screening services. Such screening rates among Korean women who are living in Korea are even lower than they are for Korean women who are living in United States; that is, only 21% to 56% of women in Korea have ever had a Pap test (Y. B. Kim, Noh, Lee, Park, & Mang, 2000; Park, Chang, & Chung, 2005; Sarna et al., 2001). Korean American women's perceived barriers to having a Pap smear could be partially due to their cultural values and attitudes toward exposing their private body parts and the traditional expectation that women sacrifice their needs. Korean women rarely expose their body parts outside their homes, which might deter them from seeking cancer-screening services (Im, 2000; Im & Meleis, 2000). Traditional Korean culture also expects Korean women to sacrifice their needs when their family members have needs to be met (Im, Lee, & Park, 2002). Other studies with Korean American women report that the absence of symptoms is the major reason why women do not receive Pap smears (Juon et al., 2003; H. Kim et al., 2004; K. Kim et al., 1999), which is also one of barriers examined in this study. Therefore, these results underscore the importance of incorporating strategies to overcome barriers when designing interventions to increase Pap test utilization. Education that addresses culture-specific beliefs could be effective in increasing cervical cancer screening utilization among Korean American women. Culture-specific information could focus on not only the importance of receiving screening when one does not have symptoms but also the strategies to overcome the emotional discomfort and practical difficulties.

This study found relatively low levels of knowledge about cervical cancer and cervical cancer screening among Korean American women, which is consistent with findings from other studies. Many participants chose to not answer the questions, because they were unfamiliar with the issues. The majority of the women did not know that human papilloma virus is related to getting cervical cancer, nor did they know what the goal of getting a Pap smear is, at what age the first Pap smear should be obtained, and what method is effective in detecting early-stage cervical cancer. However, knowledge about early detection methods significantly predicted ever having had a Pap smear. Therefore, the HBM successfully explained cervical cancer screening behaviors for Korean American women in this study:

Demographic variables, perceived benefits and barriers, and knowledge of the early detection method of cervical cancer screening were all related to cervical cancer screening behaviors. Knowledge may influence or be interwoven into Korean American women's beliefs about cervical cancer screening, which may create unique cultural beliefs about screening. These beliefs could in turn influence screening behavior.

This study has several limitations in its design and sampling. First, the findings may not be generalizable to Korean immigrants living in rural areas of the United States or where culture-specific health services are available. Second, data were collected over the telephone, which may have introduced sample selection bias. In addition, those who participated may have been more interested in cervical cancer screening than those who chose not to participate. Furthermore, Korean American women who do not have common Korean surnames or who are married to non-Koreans and have changed their last names could have different responses to this survey. For example, one study found that Korean American women with Caucasian husbands were 4 times more likely to have breast cancer screening than were women who were married to Korean husbands (Han et al., 2000). Finally, there might have been measurement error in the self-reported information about cancer screening in this study. Self-reported cancer screening frequency may differ from information obtained from the records of health care providers because self-reported cancer screening tends to overestimate its prevalence (Gordon, Hiatt, & Lampert, 1993; McPhee et al., 2002; Suarez, Goldman, & Weiss, 1995).

Despite its limitations, this study has several important implications for improving cervical cancer screening among immigrant Korean American women. Even though this study found rates of cervical cancer screening higher than those of earlier studies, the rates are still lower than those for the general U.S. population. More attention needs to be given to increasing Korean American women's cancer screening rates to meet the Healthy People 2010 objectives (U.S. Department of Health and Human Services, 2000). Interventions to promote cervical cancer screening should be within the context of past screening behaviors and culture-specific beliefs. Different emphasis could depend on whether women have ever had a Pap smear or have had one in the preceding 3 years. Research is needed to develop culture-specific interventions that focus on improving Korean American women's knowledge about cervical cancer and cancer screening and that emphasize increasing their perceived benefits from and decreasing their perceived barriers to receiving Pap tests based on their culture-specific knowledge and beliefs.

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Table 1

Point-Biserial Correlation Matrix for Independent Variables and Outcome Variables

Variable	3	4	5	6	7	8	9	10	11	12	13	14
1. Have had a test[a]	-.40**	.17*	.29**	.15*	.27**	.17*	.20*	-.08	.10	.38**	.32**	-.46**
2. Have had a test within 3 years[a]	-.23**	.19*	.12	.08	.09	-.08	.30**	.18*	.30**	.26**	.16*	-.40**
3. Age		-.60**	-.49**	-.47**	-.44**	-.15*	-.59**	.34**	.04	-.49**	-.28**	.64**
4. Marital status			.40**	.24**	-.23**	.18*	.50**	.18**	-.05	.27**	.18*	-.42**
5. Education				.27**	.41**	.23**	.42**	-.10	.04	.40**	.25**	-.38**
6. Employment					.49**	.31**	.46**	-.11	-.13	.26**	.06	-.33**
7. English-speaking ability						.56**	.52**	.033	.10	.43**	.18*	-.45**
8. Proportion of life spent in U.S.							.33**	.14*	.15*	.21**	.14	-.25**
9. Income								.14*	-.06	.46**	.16	-.47**
10. Routine care									.54**	-.09	.06	.14
11. Check-ups										.07	.08	-.05
12. Early detection method											.48**	-.51**
13. Perceived benefit												-.46**
14. Perceived barriers												

Note: Variables that were not significantly correlated are not included in the table (e.g., general health, religion, years in the United States). Data between Variable 1 and Variable 2 cannot be computed, because at least one of the variables is constant.

[a]Outcome variable.

*
 $p < .05$.

**
 $p < .01$. Two-tailed.

Table 2

Stepwise Logistic Regression Analysis Predicting Pap Smear Testing

Predictor	B	Wald Test	p	OR	OR (95% CI)	
					Lower	Upper
Ever had a Pap smear[a]						
Barriers	−1.975	14.136	.000	.139	.049	.397
Early detection method (knowledge)	1.648	5.779	.016	5.197	1.318	20.491
Constant	6.513	17.081	.000			
Had a Pap smear in past 3 years[b]						
Checkups (screening)	1.743	13.845	.000	5.715	2.241	14.571
Barriers	−2.193	20.212	.000	.112	.042	.296
Constant	5.446	20.404	.000			

Note: OR = odds ratio; CI = confidence interval.

[a] n = 160.

[b] n = 124.