Comprehensive Cancer Screening among Unmarried Women Aged 40–75 Years: Results from the Cancer Screening Project for Women

Melissa A. Clark, Ph.D.,^{1,2} Michelle L. Rogers, Ph.D.,¹ Gene F. Armstrong, B.A.,¹ William Rakowski, Ph.D.,¹ Deborah J. Bowen, Ph.D.,³ Tonda Hughes, Ph.D., M.S.N.,⁴ and Kelly A. McGarry, M.D.⁵

Abstract

Objectives: We explored self-reported rates of individual on-schedule breast, cervical, and colorectal cancer screenings, as well as an aggregate measure of comprehensive screenings, among unmarried women aged 40–75 years. We compared women who partner with women (WPW) or with women and men (WPWM) to women who partner exclusively with men (WPM). We also compared barriers to on-schedule cancer screenings between WPW/WPWM and WPM.

Methods: Comparable targeted and respondent-driven sampling methods were used to enroll 213 WPW/WPWM and 417 WPM ($n = 630$). Logistic regression models were computed to determine if partner gender was associated with each measure of on-schedule screening after controlling for demographic characteristics, health behaviors, and cancer-related experiences.

Results: Overall, 74.3% of women reported on-schedule breast screening, 78.3% reported on-schedule cervical screening, 66.5% reported on-schedule colorectal screening, and 56.7% reported being on-schedule for comprehensive screening. Partner gender was not associated with any of the measures of on-schedule screening in multivariable analyses. However, women who reported ever putting off, avoiding, or changing the place of screenings because of sexual orientation were less likely to be on-schedule for comprehensive screening. Women who reported barriers associated with taking time from work and body image concerns were also less likely to be on-schedule for comprehensive screening.

Conclusions: Barriers to cancer screening were comparable across types of examinations as well as between WPW/WPWM and WPM. Developing health promotion programs for unmarried women that address concomitant detection and prevention behaviors may improve the efficiency and effectiveness of healthcare delivery and ultimately assist in reducing multiple disease risks.

Introduction

MOST INFORMATION collected in clinical, public health, and research settings asks women to define their marital status in standard legal categories of married, divorced, widowed, or never married. The traditional assessment of marital status has been used as a proxy for the availability of a regular partner for intimate social and physical relationships.

The status of being legally married is usually the reference group to which other categories are compared.

The construct of marital status, however, is more diverse than is accounted for by the usual categories. There are over 18 million women aged 40–75 in the United States who are currently unmarried,¹ including women who are legally separated, divorced, widowed, or never married. Using only these legally defined categories of marital status to characterize

Departments of ¹Community Health and ²Obstetrics and Gynecology, Brown University Warren Alpert School of Medicine and Program in Public Health, Providence, Rhode Island.

³Department of Social and Behavioral Sciences, Boston University School of Public Health, Boston, Massachusetts.

⁴Department of Public Health, Mental Health, and Administrative Nursing, University of Illinois at Chicago College of Nursing, Chicago, Illinois.

⁵Division of General Internal Medicine, Rhode Island Hospital and Brown University Warren Alpert School of Medicine, Providence, Rhode Island.

unmarried women has limited the ability to collect information about the broader social context of their lives. The Cancer Screening Project for Women (CSPW) is one of the first studies to specifically address the attitudes and experiences of subgroups within the diverse population of unmarried women, including women who partner with women (WPW), women who partner with both women and men (WPWM), and women who partner exclusively with men (WPM).

WPW (i.e., lesbian) and WPWM (i.e., bisexual) are often referred to as sexual minority women. The proportion of women who identify as a sexual minority is assumed to be low. In a national, random probability sample, Laumann et al.² reported 0.9% of respondents identified as lesbian, 0.5% identified as bisexual, and 4.3% reported having sex with a woman sometime in their lifetime. Population prevalence estimates of middle-aged and older sexual minority women range from 1% to 5% in large community-based and population-based studies.^{3–5}

Some previous studies have concluded that sexual minority women are less likely than heterosexual women to undergo routine cancer screenings.^{6–8} More recent data, however, indicate that some of the differences that have been found may be due to study design issues. For example, although some studies of cancer risk factors have matched sexual minority women with a heterosexual sister^{9,10} or heterosexual controls,^{3,11} other studies have lacked comparison groups.^{12,13} To our knowledge, no previous study has specifically compared cancer screening behaviors between unmarried WPW/WPWM and WPM. Unmarried WPM are a relevant comparison group for WPW/WPWM because all these women do not receive the benefits of marriage, including added wealth and earnings potential,¹⁴ increases in health insurance options,¹⁵ and legitimization in society.¹⁶

The majority of studies about cancer screening behaviors have focused on one-time (i.e., ever had) and recent screenings. Fewer studies have focused on regular or repeat adherence. Unlike one-time and recent screenings, which are indicators of discrete, single, behavioral events, estimating regular/repeat screening requires assessment of a practice. This sustained performance of screening behaviors has the largest impact on cancer morbidity and mortality reduction.¹⁷

Most of the research about early detection has also used the strategy of studying individual behaviors for specific cancer sites (e.g., breast). Methods that assess only single screening modalities limit both clinical and public health efforts at cancer prevention and control. Therefore, an important public health challenge is to deliver comprehensive cancer control interventions that target multiple modalities (e.g., breast, cervical, and colorectal screening).

Our goal was to explore unmarried WPW/WPWM's and WPM's adherence to cancer-specific behaviors as well as multi-modality screenings. Our intention was to study the group of related cancer screening behaviors in addition to single cancer screening modalities to inform comprehensive cancer control interventions. Therefore, our objectives were to:

1. Compare rates of on-schedule breast, cervical, colorectal, and comprehensive cancer screenings for WPW/WPWM and WPM
2. Determine whether on-schedule cancer screenings differed between WPW/WPWM and WPM after control-

ling for demographic characteristics, health behaviors, and cancer-related experiences

3. Compare barriers to screening for WPW/WPWM and WPM

Materials and Methods

Study sample

Data were from the 2003–2005 CSPW, which included a survey examining breast, cervical, and colorectal cancer screening practices. Women were eligible if they were legally unmarried, were aged 40–75 years, currently received the majority of their healthcare in Rhode Island, and had never been diagnosed with cancer other than nonmelanoma skin cancer. The project was approved by the Brown University Human Subjects Protections Review Board.

We used principles of targeted and respondent-driven sampling¹⁸ to recruit and enroll participants. Five general sources were used for recruitment: (1) community settings, (2) health fairs, (3) mailings and fliers, (4) print media, and (5) participant social networks. Comparable strategies were used to recruit heterosexual and sexual minority women. For additional information about participant recruitment, see Clark et al.¹⁹

Following informed consent, we administered a screening protocol to assure that we obtained diverse representation across marital status (ever vs. never legally married) and sexual orientation (WPW/WPWM vs. WPM). Participants were then randomly assigned to complete the questionnaire by a self-administered mailed survey, a computer-assisted telephone interview, or a computer-assisted self-interview. Overall, we found few differences in any measures of cancer screening by data collection mode. For additional details about the data collection methods, survey timetable, and mode analyses, see Clark et al.²⁰

We obtained contact information for 773 women, of whom 630 were enrolled. Of the 143 women who were not enrolled, 60.8% ($n = 87$) were ineligible, 36.3% ($n = 52$) were unable to be contacted or refused contact, and 2.8% ($n = 4$) were not interested in participation. A total of 605 women completed the baseline questionnaire. The only significant difference between women who did and did not complete the baseline questionnaire was age; women who completed the questionnaire were older than women who did not (53.3 vs. 48.4 years, $p < 0.001$). The analysis sample included 603 women who also had valid data for the dependent variables for which they were eligible.

Measures

Dependent variables. Binary outcome variables were created for on-schedule breast, cervical, colorectal, and comprehensive screening. The coding for the individual cancer-specific screenings is shown in Table 1. Mammography is recommended every 1–2 years starting at age 40.^{21,22} Since 2003, cervical cancer screening has been recommended at 1–3-year intervals for all women, depending on age, type of test received, and number of successive normal tests. Women over the age of 70 may stop receiving Pap tests at their physician's discretion.^{21,22} Unfortunately, we did not include questions about the number of successive recent normal Pap tests received, nor did we ask whether a doctor recommended less

TABLE 1. DEFINITIONS OF ON-SCHEDULE CANCER SCREENINGS

Breast screening	Cervical screening	Colorectal screening
<p><i>Aged 45–75</i> At least 2 mammograms: Most recent mammogram ≤2 years AND <2 years between 2 most recent mammograms</p>	<p><i>Aged 40–75</i> At least 2 Pap tests Most recent Pap tests ≤3 years AND <3 years between 2 most recent Pap tests</p>	<p><i>Aged 56–75</i> At least 1 colonoscopy Most recent colonoscopy ≤10 years</p>
<p><i>Aged 42–44</i> At least 1 mammogram Most recent mammogram ≤2 years</p>	<p>IF Has had a hysterectomy, not included in analyses for cervical screening</p>	<p>OR At least 2 sigmoidoscopies Most recent sigmoidoscopy ≤5 years AND <5 years between 2 most recent sigmoidoscopies</p>
<p><i>Aged 40–41</i> Not included in analyses for breast screening</p>		<p>OR At least 2 FOBTs Most recent FOBT <1 year AND <2 years between 2 most recent FOBTs</p>
		<p><i>Aged 51–55</i> At least 1 colonoscopy Most recent colonoscopy ≤10 years OR At least 1 sigmoidoscopy Most recent sigmoidoscopy ≤5 years OR At least 2 FOBTs Most recent FOBT <1 year AND <2 years between 2 most recent FOBTs</p>
		<p><i>Aged 40–50</i> Not included in analyses for colorectal screening</p>

frequent screening. For colorectal cancer screening, either an annual fecal occult blood test (FOBT), a flexible sigmoidoscopy every 5 years, or a colonoscopy every 10 years is recommended, starting at age 50.^{21,22} We used the most conservative age-appropriate recommended interval between screenings to determine if a woman was up-to-date for each type of examination (e.g., 2 years between mammograms, 3 years between Pap tests). For breast and cervical screening, we determined on-schedule status for each type of screening based on the two most recent examinations. On-schedule colorectal screening was determined based on a woman's age and the type of examination (Table 1). For example, a 52-year-old woman was classified as on-schedule for colorectal screening if she had (1) at least one colonoscopy within the past 10 years, (2) at least one sigmoidoscopy within the past 5 years, or (3) an FOBT within the past year and <2 years between two most recent FOBTs. Women who were within their initial eligibility period (aged 40–41 for breast screening, $n=43$), not yet age eligible (aged 40–50 for colorectal screening, $n=276$), or no longer eligible (hysterectomy for cervical screening, $n=29$) were excluded from analyses of that screening type. To compute the measure of comprehensive screening, we calculated a ratio of the number of on-schedule screenings a woman had obtained relative to the number of types of screening for which she was eligible. Women could be eligible for 0, 1, 2, or 3 types of on-schedule screenings. Therefore, the ratios of obtained to eligible screenings were 0 (0 screenings obtained of those eligible),

0.33 (1 of 3 screenings), 0.50 (1 of 2 screenings), 0.67 (2 of 3 screenings), or 1.0 (1 of 1, 2 of 2, or 3 of 3). Women with a ratio of 1.0 were considered on-schedule for comprehensive screening.

Independent variables.

Partner gender. As part of the screening protocol, women were asked their current marital status, followed by the gender of a current partner or gender choice of a future partner if they were not currently in a relationship. Eligible women were then assigned to one of six marital status/partner gender strata: (1) never married women who partner with women (WPW) or with either women or men (WPWM), (2) previously married WPW and WPWM, (3) never married women who partner with men (WPM), (4) previously married WPM, (5) never married women with no partner preference (NPP), and (6) previously married NPP. Strata 5 and 6 included women who reported no interest in having a partner and refused to select the gender of a potential future partner.

We classified participants as women who partner with women exclusively or with either women or men (WPW and WPWM, strata 1 and 2), partner exclusively with men (WPM, strata 3 and 4), or did not indicate a partner gender (NPP, strata 5 and 6). WPW and WPWM were combined for all analyses for two reasons. First, the demographic, health behavior, and cancer-related characteristics were comparable for WPW and WPWM. Second, only 16 women classified themselves as WPWM, limiting our ability to analyze them

separately. The 23 NPP were combined with WPM for all analyses for similar reasons.

Demographic characteristics. Demographic characteristics included marital status (never married vs. previously married), age (continuous), education (less than college education vs. college education or more), employment status (employed full or part-time vs. not employed), household income (<\$30,000 vs. ≥\$30,000), race (white vs. nonwhite), and health insurance coverage (yes vs. no).

Health behaviors. Health behaviors included smoking status (current smoker vs. nonsmoker) and heavy alcohol use in the past 30 days (four or more drinks on one or more occasions vs. less alcohol use). These behaviors previously have been associated with cancer screenings or have been reported to be higher for sexual minority than heterosexual women.

Cancer-related experiences. Women were coded as having a family history of cancer if they reported at least one first-degree relative with a history of cancer. We asked 12 items to assess 8 different barriers associated with cancer screenings. The items measuring barriers to screening were developed and refined during formative work in earlier phases of the CSPW (see Clark et al.^{23,24} for details of focus groups and cognitive-based interviews). First, women were asked if they had ever put off or avoided having a mammogram, Pap test, sigmoidoscopy, or colonoscopy because of (1) problems taking time from work, (2) problems with transportation, (3) medical problems, or (4) responsibilities for dependents (e.g., children, elders). Next, we asked women if they had ever put off or avoided having a mammogram, Pap test, sigmoidoscopy, or colonoscopy because they felt embarrassed or emotionally uncomfortable showing their body to a healthcare provider (e.g., body image) or had a disability. We also asked women if they had avoided or put off having cancer screening tests because they were concerned about unpleasant experiences at the places where they go for cancer screening tests because of their sexual orientation (e.g., identity) or physical attraction to women vs. men. Finally, we asked comparable questions about whether women had changed the place they had gone because of body image, a disability, sexual orientation, or physical attraction to women vs. men. Women were then coded as having reported the barrier if they indicated that they had put off, avoided, or changed the place they went for screenings for that reason. Three to five percent of respondents did not answer the questions about barriers associated with work, transportation, medical care, or dependent care. These women had cancer screening rates comparable to those who endorsed the barrier. Therefore, in all analyses, women with missing data were combined with those who endorsed the barrier. There was <1% missing data for other barrier questions; these missing responses were deleted for all analyses. For multivariable analyses, we created a scale of number of reported barriers (potential range 0–9).

Data analysis

We analyzed the data using SAS/STAT[®] software, version 9.1 of the SAS system for Windows (Cary, NC). First, we compared participant characteristics by partner gender. Second, we computed four univariable logistic regression models to compare rates of on-schedule breast, cervical, colorectal, and comprehensive screenings by partner gender. Third, we computed four logistic regression models to determine if

partner gender was associated with each of the measures of on-schedule screening, controlling for marital status, age, education, employment, household income, race, smoking status, heavy alcohol use, family history of cancer, and the summary measure of number of reported barriers to screening. In addition, the models included indicators of recruitment source and data collection method. In the multivariable models, we excluded health insurance status and Hispanic ethnicity because of the low prevalence; 11.0% of women did not have health insurance, and 5% identified as Hispanic. For each model, we tested for an interaction between partner gender and the summary measure of reported barriers to screening. Fourth, we compared the specific barriers to screening by partner gender by computing logistic regression models that included partner gender, the specific barrier to screening, and an interaction between partner gender and the specific barrier. Finally, we computed multivariable logistic regression models to assess the effect of specific barriers on each of the measures of on-schedule screening. For all models, we assessed goodness of fit with the Hosmer-Lemeshow test. Statistical significance for all analyses was set at a two-sided 0.05 alpha level.

Results

Characteristics of study participants

As shown in Table 2, compared with WPM, WPW/WPWM were more likely to be never married, be younger, have a college education or more, be employed, report household incomes of ≥\$30,000, identify as white, and report having health insurance. Although there was no difference by partner gender for current cigarette smoking, WPW were more likely to report heavy alcohol use in the past 30 days. WPM were more likely than WPW to report having at least one first-degree relative with a history of cancer. The mean number of reported barriers to screening was 0.9 (SD = 1.4, range 0–6). There were no differences by partner gender for the number of reported barriers to cancer screening.

Self-reported on-schedule cancer screenings

Overall, 74.3% of women reported on-schedule breast screening, 78.3% reported on-schedule cervical screening, 66.5% reported on-schedule colorectal screening, and 56.7% reported being on-schedule for comprehensive screening. In bivariate analyses, WPW were more likely than WPM to report on-schedule cervical screening (WPW = 84.2% vs. WPM = 75.1%, unadjusted odds ratio [UOR] = 1.7, 95% unadjusted confidence limit [UCL] = 1.1, 2.8) and comprehensive screening (WPW = 65.1% vs. WPM = 52.4%, UOR = 1.7, 95% UCL = 1.2, 2.4). However, controlling for demographic characteristics, health behaviors, cancer-related experiences, recruitment source, and data collection mode, partner gender was not associated with cervical screening (adjusted or [AOR] = 1.1, 95% adjusted confidence limit [ACL] = 0.6, 2.0) or comprehensive screening (AOR = 0.9, 95% ACL = 0.5, 1.4). There were no differences by partner gender in the bivariate or multivariable analyses of on-schedule breast screening (WPW = 77.3% vs. WPM = 72.9%, UOR = 1.3, 95% UCL = 0.8, 1.9; AOR = 0.8, 95% ACL = 0.5, 1.5) or colorectal screening (WPW = 64.9% vs. WPM = 66.9%, UOR = 0.9, 95% UCL = 0.5, 1.6; AOR = 0.8, 95% ACL = 0.4, 1.6).

TABLE 2. PARTICIPANT CHARACTERISTICS BY PARTNER GENDER, RHODE ISLAND, 2003–2005

Characteristic (%)	Total n = 603	WPW and WPWM ^a n = 206	WPM and NPP n = 397
Demographic characteristics			
Never married***	50.8	67.5	42.1
Age (mean)***	53.3	48.1	55.4
College education or more***	57.6	71.2	50.6
Employed full or part-time***	70.6	85.4	62.8
Household income $\geq$ \$30,000***	56.2	84.0	41.8
White race***	75.7	86.8	69.9
Hispanic ethnicity	4.5	2.5	5.6
Has health insurance**	89.0	94.6	86.0
Health behaviors			
Currently smokes cigarettes	19.6	17.0	20.9
Heavy alcohol use in past 30 days**	18.7	25.0	15.4
Cancer-related experiences			
First-degree relative with history of cancer***	63.4	54.2	68.2
Any reported barriers to cancer screening	45.1	42.2	46.6

^aWPW, women who partner with women; WPWM, women who partner with women or men; WPM, women who partner with men; NPP, no partner preference/refused gender of potential future partner.

** $p < 0.01$; *** $p < 0.001$.

In the multivariable analyses, number of barriers to cancer screening was the only variable associated with all four measures of on-schedule screening. There were no significant interactions between partner gender and number of barriers to screening for any of the measures of on-schedule screening.

Barriers to screening

Next, we compared the specific barriers to screening between WPW and WPM. Almost half (45.1%) of the women reported at least one barrier to screening. Overall, the percent of women reporting a specific barrier ranged from 4.5% for barriers due to a disability to 22.7% for problems taking time off from work. WPM were more likely than WPW to report transportation barriers (15.4% vs. 6.8%), medical problems (12.9% vs. 5.8%), and responsibilities to dependents (10.8 vs. 5.3%). However, there were no differences by partner gender for any of the other six specific self-reported barriers. There were also no significant interactions between partner gender and the specific barriers for any of the measures of on-schedule screening.

Table 3 shows the relationship of each specific barrier with the measures of on-schedule screening, controlling for demographic characteristics, health behaviors, and cancer-related experiences for all women combined. Women who reported they had put off or avoided screenings because of problems taking time off work were less likely to be on-schedule for breast, colorectal, and comprehensive screening. On-schedule screening was not associated with transportation or dependent care barriers. Women with barriers as a result of medical problems were less likely to be on-schedule for cervical screening. Women who had put off, avoided, or changed the place of screenings because of body image concerns were less likely to report on-schedule colorectal and comprehensive screening. Women who reported they had put off, avoided, or changed the place of screenings because of their sexual orientation were less likely to report being on-schedule for all types of screenings, with the strongest relationships for breast and comprehensive screenings. However,

the measure of physical attraction to others was not associated with any of the screening measures. Small percentages of women reported barriers associated with having a disability, prohibiting multivariable analyses with this measure.

Discussion

To our knowledge, this is the first study to compare unmarried women who partner with women or with both women and men with comparably aged women who partner exclusively with men on adherence to multiple cancer screening practices. We assessed experiences with breast, cervical, and colorectal cancer screenings and classified each woman as being on-schedule or not. We also developed a measure of comprehensive screening based on each woman's adherence to all three types of cancer screenings for which she was eligible.

We did not find significant differences by partner gender for any of the measures of on-schedule screening after controlling for important differences in demographic characteristics, health behaviors, and cancer-related experiences. To our knowledge, there are no other studies with an equivalent sample of unmarried women aged 40–75 years with which to compare our results. Based on results of other studies that included heterosexual and sexual minority women,^{7,8} we hypothesized that WPW and WPWM would be less likely than WPM to be on-schedule for breast, cervical, and colorectal screenings. There are at least two reasons that may explain why we did not find that WPW/WPWM were less likely than WPM to receive recommended screenings. First, Rhode Island is one of only a few states in the United States to have nondiscriminatory policies toward sexual minorities. Therefore, within the political and social context, women in Rhode Island may have better experiences with healthcare than have women in other parts of the country. Second, the relatively small sample size of WPW and WPWM may have limited our ability to detect important differences based on partner gender. However, all the odds ratios for the relationships between partner gender and the screening variables were very close to

TABLE 3. ON-SCHEDULE CANCER SCREENINGS BY SELF-REPORTED BARRIERS TO SCREENING, RHODE ISLAND, 2003–2005

<i>Self-reported barriers to screening</i>	<i>On-schedule breast screening (n^a = 557)</i>		<i>On-schedule cervical screening (n^a = 575)</i>		<i>On-schedule colorectal screening (n^a = 328)</i>		<i>On-schedule comprehensive screening (n^a = 603)</i>	
	%	AOR ^b (95% CL)	%	AOR ^b (95% CL)	%	AOR ^b (95% CL)	%	AOR ^b (95% CL)
Put off or avoided screenings because of								
Problems taking time from work								
Yes/did not answer (<i>n</i> = 137)	60.0	0.4 (0.3, 0.7)	74.8	0.8 (0.5, 1.4)	47.1	0.4 (0.2, 0.8)	46.0	0.5 (0.3, 0.8)
No (<i>n</i> = 466)	78.5	Reference	79.3	Reference	71.5	Reference	59.9	Reference
Problems with transportation								
Yes/did not answer (<i>n</i> = 75)	59.7	0.8 (0.4, 1.6)	63.2	0.6 (0.3, 1.1)	52.4	0.6 (0.3, 1.3)	44.0	0.9 (0.5, 1.6)
No (<i>n</i> = 528)	76.3	Reference	80.3	Reference	68.5	Reference	58.5	Reference
Medical problems								
Yes/did not answer (<i>n</i> = 63)	62.5	0.8 (0.4, 1.7)	58.2	0.4 (0.2, 0.9)	48.7	0.5 (0.2, 1.2)	44.4	0.9 (0.5, 1.7)
No (<i>n</i> = 540)	75.7	Reference	80.4	Reference	68.7	Reference	58.2	Reference
Responsibilities for dependents (e.g., children, elders)								
Yes/did not answer (<i>n</i> = 54)	59.2	0.6 (0.3, 1.4)	66.7	0.7 (0.3, 1.6)	48.2	0.6 (0.2, 1.8)	44.4	0.8 (0.4, 1.6)
No (<i>n</i> = 549)	75.8	Reference	79.4	Reference	68.1	Reference	57.9	Reference
Put off, avoided, or changed the place of screenings because of								
Concerns about body image								
Yes (<i>n</i> = 130)	66.4	0.7 (0.4, 1.1)	72.7	0.6 (0.4, 1.1)	42.9	0.3 (0.2, 0.6)	46.9	0.5 (0.3, 0.8)
No (<i>n</i> = 466)	76.8	Reference	79.8	Reference	70.1	Reference	59.4	Reference
Sexual orientation								
Yes (<i>n</i> = 33)	46.7	0.3 (0.1, 0.7)	62.5	0.5 (0.2, 1.0)	36.8	0.4 (0.1, 1.2)	33.3	0.4 (0.1, 0.8)
No (<i>n</i> = 565)	76.1	Reference	79.2	Reference	68.1	Reference	58.1	Reference
Physical attraction to others								
Yes (<i>n</i> = 35)	61.3	0.6 (0.3, 1.3)	66.7	0.6 (0.3, 1.5)	58.8	0.7 (0.2, 2.2)	48.6	0.7 (0.3, 1.6)
No (<i>n</i> = 562)	75.2	Reference	79.3	Reference	66.6	Reference	57.3	Reference
Self-reported disability								
Yes (<i>n</i> = 27)	73.9	— ^c	74.1	— ^c	57.1	— ^c	59.3	— ^c
No (<i>n</i> = 575)	74.3		78.6	Reference	66.8	Reference	56.7	Reference

^aNumber eligible for type of on-schedule screening.^bAll models also include partner gender, marital status, age, education, income, employment, race, smoking status, alcohol use, family history of cancer, recruitment source and data collection mode.^cAdjusted model was not computed because of sample size.

1.0. It is, therefore, not likely that increased sample sizes would change the conclusions substantially. As a result, we encourage other investigators to replicate our methods to determine the generalizability of the findings.

Overall, 75% of women in our sample reported being on-schedule for breast and cervical cancer screenings, and 66% reported being on-schedule for colorectal screening. On the other hand, slightly more than half of all women were on-schedule for comprehensive screening. Our finding that 75% of women reported on-schedule mammography screening is only slightly higher than the 72% of women who reported repeat, on-schedule screening in a national level survey conducted in 2002–2003.²⁵ Our rates may be somewhat inflated for at least three reasons. First, to ensure sufficient numbers of sexual minority women, we used nonprobability-based sampling methods. As a result, our sample was highly educated, predominantly white, and had relatively higher incomes, all characteristics previously shown to be associated with increased screening rates.^{25,26} Second, in 2002, Rhode Island had the highest percentage of women in the United States who reported recent mammography and ranked in the top seven states for reports of recent sigmoidoscopy and fecal occult blood tests.²⁷ However, among women who participated in the 2004 Rhode Island Behavioral Risk Factor Surveillance Survey, rates of screening were 83% for mammography within the previous 2 years, 91% for Pap test within the previous 3 years, 31% for FOBT within the past 2 years, and 55% for sigmoidoscopy or colonoscopy within the previous 10 years. Assuming relative consistency in screening patterns, this translates to repeat, on-schedule screening rates of about 68% (i.e., $83\% \times 83\%$) for breast and 81% (i.e., $91\% \times 91\%$) for cervix. Finally, our results may have been affected by question wording and the definitions used for on-schedule status. In a previous review of repeat mammography screening, we found that rates varied substantially across studies based on the items used to define repeat screening.²⁸ The absence of effects as a result of recruitment source and data collection mode suggest that if there is a bias toward higher rates, it is likely due to the items used to define on-schedule screening.

As expected, we found that women with more barriers to screening were more likely to report being off-schedule for screenings. In addition, there were specific barriers associated with being off-schedule for one or more screening examinations. There were no differences by partner gender, however, in the number of reported barriers, the specific types of barriers reported, or the effect of barriers on the likelihood of on-schedule screening.

In the total sample, 6% of respondents reported they had put off, avoided, or changed the place they went for cancer screenings because of their sexual orientation. These women were significantly more likely to be off-schedule for comprehensive screening as well as breast screening specifically. We did not find significant differences by partner gender; 5% (18 of 395) of WPM/NPP and 7% (15 of 203) of WPW/WPWM reported barriers associated with sexual orientation. We have no data to describe the circumstances involving the reported experiences associated with sexual orientation. However, in focus group and cognitive interview phases of the CSPW, WPM reported incidents of sexual harassment and unwanted advances by healthcare providers during cancer screenings, and WPW reported experiences of verbal and behavioral

discrimination based on their sexual minority status. Therefore, although they may have had different types of experiences based on sexual orientation, it appears that for a small percentage of both WPW and WPM, these negative encounters with healthcare providers affected their willingness to undergo routine screenings at recommended intervals.

We found that concern about body image was one of the most frequently reported specific barriers to cancer screenings regardless of sexual orientation; 21% of WPM and 23% of WPW reported they had put off, avoided, or changed the place they went for cancer screenings because of concerns about body image, and these body image concerns were associated with lower likelihood of screening. Other investigators found that obese women were less likely than normal weight women to have had recent screenings,^{29,30} and in a recent study, Zhu et al.³¹ found that both obese and underweight women were less likely to have had a recent screening. We did not ask questions to calculate body mass index (BMI) and, therefore, cannot determine characteristics of women who reported barriers due to body image. Although BMI was not associated with Pap testing for African American and Hispanic women, Wee et al.²⁹ found that a higher proportion of obese white women than normal weight white women cited embarrassment or discomfort as the primary reason for not undergoing screening. Obese women may have poor self-image related to body weight, and underweight women may be afraid of questions about low weight. As a result, women may delay preventive screenings because of actual or perceived negative attitudes or judgmental behaviors from health professionals. Thus, strategies are needed to address women's reservations about undergoing screening. These strategies could include sensitivity training for providers about patient-provider interactions for delivering recommendations for screening and for actually performing the tests. Other strategies could include addressing contextual features of screening that may reduce body image concerns, including private changing areas, adequately sized gowns, and accessible examination tables.

Previous studies have generally found that employed women are more likely than unemployed women to be on-schedule for screening.^{32,33} In our sample, women who specifically reported problems taking time off from work were more likely to be off-schedule for breast, colorectal, and comprehensive screening but not cervical screening. To obtain a mammogram, sigmoidoscopy, or colonoscopy, women generally must schedule an appointment separate from a general medical visit. Threats of lost income or actual job loss because of taking time from work for multiple medical visits may be particularly relevant for unmarried women who are more likely than married women to depend solely on their own employment for financial security. Therefore, unmarried women, regardless of sexual orientation, may benefit from screening providers who offer evening and weekend appointments or opportunities to obtain multiple cancer screenings (i.e., mammogram and Pap test) during the same medical visit.

Our study had a number of strengths. First, although the ideal approach would have been to draw a representative, population-based sample, it is particularly difficult to sample sufficiently large numbers of sexual minority women using these methods. Therefore, we used principles of targeted^{34,35} and respondent-driven¹⁸ sampling that were comparable for

recruiting WPW/WPWM and WPM. Furthermore, we controlled for recruitment source in all our analyses. Next, our sample included diverse groups of women including 25% women of color and 44% with household incomes <\$30,000. Finally, we had a high study completion rate; 95% of women who were eligible and agreed to participate completed the baseline questionnaire.

There are also a number of study limitations. Unfortunately, because sexual orientation is not asked of all individuals in the census or on any large statewide population-based survey, we do not have data to compare our sample to the eligible Rhode Island population. Second, this study was based on self-reported behaviors. Although other investigators have found both underestimation³⁶ and overestimation³⁷ in self-reported cancer screening data, concordance with medical record documentation has been generally satisfactory.^{38–40} Third, we determined on-schedule screening status based on intervals recommended by the National Cancer Institute and American Cancer Society, although controversies remain about screening, including age to begin screening and frequency with which screenings should be obtained.^{41,44} Fourth, we were unable to interpret the causal relationship between cancer screening adherence and other factors because of the cross-sectional nature of the study design. Finally, because our sample included only unmarried women, we are not able to address differences in rates of comprehensive cancer screenings between unmarried and married women.

Conclusions

Despite the limitations, our findings raise important considerations for research and program planning for cancer detection and control. We found no differences in on-schedule screening status by partner gender among our sample of unmarried women. Rather, we found that several barriers to screening were comparable by partner gender and across types of examinations. Therefore, future research could benefit from further accessing the barriers to and facilitators of multiple screening examinations for all unmarried women regardless of sexual orientation. Second, similar to a study by Coughlin et al.,⁴⁵ our data suggest that women who were off-schedule for one screening examination may benefit from programs that identify and address other prevention and detection behaviors. Developing health promotion programs that address concomitant prevention and detection behaviors may improve the efficiency and effectiveness of healthcare delivery and ultimately assist in reducing multiple disease risks.

Acknowledgments

Support for this research was provided by the National Cancer Institute, K07-CA87070 to M.A.C.

Disclosure Statement

No competing financial interests exist.

References

1. U.S. Census Bureau. Marital status of the population 15 years old and over, by sex and race: 1950 to present, 2003.
2. Laumann EO, Gagnon JH, Michael RT, Michaels S. Homosexuality. In: Laumann EO, Gagnon JH, Michael RT, Michaels S, eds. *The social organization of sexuality: Sexual practices in the United States*. Chicago, IL: University of Chicago Press, 1994:283–320.
3. Valanis BG, Bowen DJ, Bassford T, Whitlock E, Charney P, Carter RA. Sexual orientation and health: Comparisons in the Women's Health Initiative sample. *Arch Fam Med* 2000; 9:843–853.
4. Case P, Austin SB, Hunter DJ, et al. Disclosure of sexual orientation and behavior in the Nurses' Health Study II: Results from a pilot study. *J Homosex* 2006;51:13–31.
5. Bowen DJ, Bradford J, Powers D. Comparing sexual minority status across sampling methods and populations. *Women Health* 2006;44:121–134.
6. Cochran SD, Mays VM, Bowen D, et al. Cancer-related risk indicators and preventive screening behaviors among lesbians and bisexual women. *Am J Public Health* 2001;91:591–597.
7. Diamant AL, Wold C, Spritzer K, Gelberg L. Health behaviors, health status, and access to and use of health care: A population-based study of lesbian, bisexual, and heterosexual women. *Arch Fam Med* 2000;9:1043–1051.
8. Matthews AK, Brandenburg DL, Johnson TP, Hughes TL. Correlates of underutilization of gynecological cancer screening among lesbian and heterosexual women. *Prev Med* 2004;38:105–113.
9. Dibble SL, Roberts SA, Nussey B. Comparing breast cancer risk between lesbians and their heterosexual sisters. *Womens Health Issues* 2004;14:60–68.
10. Rothblum ED, Factor R. Lesbians and their sisters as a control group: Demographic and mental health factors. *Psychol Sci* 2001;12:63–69.
11. Case P, Austin SB, Hunter DJ. Sexual orientation, health risk factors, and physical functioning in the Nurses' Health Study II. *J Womens Health* 2004;13:1033–1047.
12. Grindel CG, McGehee LA, Patsdaughter CA, Roberts SJ. Cancer prevention and screening behaviors in lesbians. *Women Health* 2006;44:15–39.
13. Roberts SJ, Patsdaughter CA, Grindel CG, Tarmina MS. Health related behaviors and cancer screening of lesbians: Results of the Boston Lesbian Health Project II. *Women Health* 2004;39:41–55.
14. Oppenheimer VK. A theory of marriage timing. *Am J Sociol* 1988;94:563–591.
15. Zuvekas SH, Taliaferro GS. Pathways to access: Health insurance, the health care delivery system, and racial/ethnic disparities, 1996–1999. *Health Aff (Millwood)* 2003;22:139–153.
16. Lewin E. Does marriage have a future? *J Marriage Fam* 2004;66:1000–1006.
17. Humphrey LL, Helfand M, Chan BK, Woolf SH. Breast cancer screening: A summary of the evidence for the U.S. Preventive Services Task Force. *Ann Intern Med* 2002;137:347–360.
18. Heckathorn DD. Respondent-driven sampling: A new approach to the study of hidden populations. *Soc Problems* 1997;44:174–199.
19. Clark MA, Neighbors CJ, Wasserman MR, et al. Strategies and cost of recruitment of middle-aged and older unmarried women in a cancer screening study. *Cancer Epidemiol Biomarkers Prev* 2007;16:2605–2614.
20. Clark MA, Rogers ML, Armstrong GF, Rakowski W, Kviz FJ. Differential effects of mode of data collection in a cancer screening study of unmarried women ages 40–75: A randomized trial. *BMC Med Res Method* 2008;8:10.

21. American Cancer Society. Guidelines for the early detection of cancer. www.cancer.org/docroot/PED/content/PED_2_3X_ACS_Cancer_Detection_Guidelines_36.asp. Accessed February 26, 2007.
22. National Cancer Institute. Screening and testing to detect cancer. www.cancer.gov/cancertopics/screening. Accessed February 26, 2007.
23. Clark MA, Bonacore L, Wright SJ, Armstrong G, Rakowski W. The cancer screening project for women: Experiences of women who partner with women and women who partner with men. *Women Health* 2003;38:19–33.
24. Clark MA, Armstrong G, Bonacore L. Measuring sexual orientation and gender expression among middle-aged and older women in a cancer screening study. *J Cancer Educ* 2005;20:108–112.
25. Rakowski W, Meissner H, Vernon SW, Breen N, Rimer B, Clark MA. Correlates of repeat and recent mammography for women ages 45 to 75 in the 2002 to 2003 Health Information National Trends Survey (HINTS 2003). *Cancer Epidemiol Biomarkers Prev* 2006;15:2093–2101.
26. Rakowski W, Breen N, Meissner H, et al. Prevalence and correlates of repeat mammography among women aged 55–79 in the Year 2000 National Health Interview Survey. *Prev Med* 2004;39:1–10.
27. Balluz L, Ahluwalia IB, Murphy W, Mokdad A, Giles W, Harris VB. Surveillance for certain health behaviors among selected local areas—United States, Behavioral Risk Factor Surveillance System, 2002. *MMWR Surveill Summ* 2004;53:1–100.
28. Clark MA, Rakowski W, Bonacore LB. Repeat mammography: prevalence estimates and considerations for assessment. *Ann Behav Med* 2003;26:201–211.
29. Wee CC, Phillips RS, McCarthy EP. BMI and cervical cancer screening among white, African-American, and Hispanic women in the United States. *Obes Res* 2005;13:1275–1280.
30. Fontaine KR, Heo M, Allison DB. Body weight and cancer screening among women. *J Womens Health Gend Based Med* 2001;10:463–470.
31. Zhu K, Wu H, Jatoi I, Potter J, Shriver C. Body mass index and use of mammography screening in the United States. *Prev Med* 2006;42:381–385.
32. Lockwood-Rayermann S. Characteristics of participation in cervical cancer screening. *Cancer Nurs* 2004;27:353–363.
33. Rodvall Y, Kemetli L, Tishelman C, Tornberg S. Factors related to participation in a cervical cancer screening programme in urban Sweden. *Eur J Cancer Prev* 2005;14:459–466.
34. Muhib FB, Lin LS, Stueve A, et al. A venue-based method for sampling hard-to-reach populations. *Public Health Rep* 2001;116(Suppl 1):216–222.
35. Watters JK, Biernacki P. Targeted sampling: Options for the study of hidden populations. *Soc Problems* 1989;36:416–430.
36. Kagay CR, Quale C, Smith-Bindman R. Screening mammography in the American elderly. *Am J Prev Med* 2006;31:142–149.
37. Hiatt RA, Perez-Stable EJ, Quesenberry C Jr., Sabogal F, Otero-Sabogal R, McPhee SJ. Agreement between self-reported early cancer detection practices and medical audits among Hispanic and non-Hispanic white health plan members in northern California. *Prev Med* 1995;24:278–285.
38. Gordon NP, Hiatt RA, Lampert DI. Concordance of self-reported data and medical record audit for six cancer screening procedures. *J Natl Cancer Inst* 1993;85:566–570.
39. Zapka JG, Bigelow C, Hurley T, et al. Mammography use among sociodemographically diverse women: The accuracy of self-report. *Am J Public Health* 1996;86:1016–1021.
40. Montano DE, Phillips WR. Cancer screening by primary care physicians: A comparison of rates obtained from physician self-report, patient survey, and chart audit. *Am J Public Health* 1995;85:795–800.
41. Kopans DB. The breast cancer screening controversy and the National Institutes of Health Consensus Development Conference on Breast Cancer Screening for Women Ages 40–49. *Radiology* 1999;210:4–9.
42. Moss S. Should women under 50 be screened for breast cancer? *Br J Cancer* 2004;91:413–417.
43. Pineau G. Should Canadians be offered systematic screening for colorectal cancer? Yes. *Can Fam Physician* 2008;54:504–506.
44. Turcotte F. Should Canadians be offered systematic screening for colorectal cancer? No. *Can Fam Physician* 2008;54:505–506.
45. Coughlin SS, Uhler RJ, Hall HI, Briss PA. Nonadherence to breast and cervical cancer screening: What are the linkages to chronic disease risk? *Prev Chron Dis* 2004;1:A04.

Address reprint requests to:
Melissa A. Clark, Ph.D.

Brown University Warren Alpert School of Medicine
and Program in Public Health
Box G-S121, 6th floor
Providence, RI 02912

E-mail: Melissa_Clark@brown.edu