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A Randomized Controlled Trial of Interventions to Promote Cervical Cancer Screening Among Chinese Women in North America

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Abstract

Background—North American Chinese women have lower levels of Papanicolaou (Pap) testing than other population subgroups. We conducted a randomized controlled trial to evaluate the effectiveness of two alternative cervical cancer screening interventions for Chinese women living in North America.

Methods—Four hundred and eighty-two Pap testing underutilizers were identified from community-based surveys of Chinese women conducted in Seattle, Washington, and Vancouver, British Columbia. These women were randomly assigned to one of two experimental arms or control status. Several Chinese-language materials were used in both experimental arms: an education-entertainment video, a motivational pamphlet, an educational brochure, and a fact sheet. Women in the first experimental group (outreach worker intervention) received the materials, as well as tailored counseling and logistic assistance, during home visits by trilingual, bicultural outreach workers. Those in the second experimental group (direct mail intervention) received the materials by mail. The control group received usual care. Follow-up surveys were completed 6 months after randomization to ascertain participants' Pap testing behavior. All statistical tests were two-sided.

Results—A total of 402 women responded to the follow-up survey (83% response rate). Of these women, 50 (39%) of the 129 women in the outreach group, 35 (25%) of the 139 women in the direct mail group, and 20 (15%) of the 134 women in the control group reported Pap testing in the interval between randomization and follow-up data collection ($P<.001$ for outreach worker versus control, $P = .03$ for direct mail versus control, and $P = .02$ for outreach worker versus direct mail). Intervention effects were greater in Vancouver than in Seattle.

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Notes

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Conclusion—Culturally and linguistically appropriate interventions may improve Pap testing levels among Chinese women in North America.

Asians in North America remain one of the most poorly understood minorities in terms of their preventive care needs, and their health problems have received little attention *(1,2).* Census Bureau information indicates there were over 2 million ethnic Chinese living in North America by the early 1990s. Furthermore, Chinese are now the largest Asian subgroup in both Canada and the United States *(3,4).* Over the last four decades, Chinese immigration to North America has increased dramatically. Consequently, North America's Chinese population is heterogeneous and largely foreign-born *(4–6).*

One of the six U.S. national goals for reducing racial/ethnic health disparities specifically addresses cancer screening rates *(7).* Several analyses *(8,9)* have suggested that Chinese women have higher invasive cervical cancer rates than the general North American population. The rates of invasive cervical cancer among Chinese and non-Latina white women living in Los Angeles are 12.3 and 7.2 per 100 000, respectively *(9).* Chinese women in British Columbia have twice the cervical cancer risk of whites in the province *(8).* Few reports have addressed Papanicolaou (Pap) testing levels among Chinese in North America. However, 45% of Chinese women who participated in an ethnically focused behavioral risk factor survey conducted in Oakland, California, during 1989–1990 had never been screened for cervical cancer (compared with 5% of the total female population of California), and only 37% of Chinese women respondents to a 1994 San Francisco survey were routinely obtaining Pap testing *(10,11).* Furthermore, Canadian investigators found that the proportion of Chinese among all British Columbia women having cervical smears was statistically significantly lower than the proportion of Chinese women among the general population *(8).*

Door-to-door canvassing is believed to be an effective way of recruiting minority women to cancer control programs, and it has been demonstrated that in-home educational sessions can increase Pap testing participation among minority women *(12,13).* Several research groups have demonstrated that direct mail strategies (including invitational letters and/or pamphlets) can be effective in promoting cervical cancer screening attendance among some population subgroups *(14,15).* However, little information is available about effective Pap testing interventions for Chinese populations in North America. We conducted a randomized controlled trial to evaluate the impact of two culturally and linguistically appropriate cervical cancer control educational interventions: a "high intensity" outreach worker-based intervention and a "low intensity" direct mail intervention. In this article, we report our findings with respect to the impact of our intervention approaches.

Methods

Study Settings

The trial was conducted in two West Coast cities: Seattle, Washington, and Vancouver, British Columbia. These metropolitan areas, which are only 150 miles apart, vary with respect to the size and density of their Chinese communities and their health care systems. Seattle has individual census tracts with a relatively high population of Chinese, although they comprise only a small percentage of the total population *(16).* In contrast, one in four Vancouver residents is of Chinese descent *(17).* Seattle's Chinese population is concentrated in the southern and central regions of the city; these areas are served by a network of community clinics—some of which offer services at reduced cost—and Chinese language interpreter services *(16).* Three areas of Metropolitan Vancouver have a particularly high concentration of Chinese Canadians: East Vancouver, Richmond, and Strathcona. British Columbia has a Provincial Medical Service Plan that provides all health care, including cervical cancer screening, at no cost to

residents. In addition, Vancouver has many Chinese Canadian physicians who speak a Chinese language or dialect.

Overview of Trial Design

The study design is summarized in Fig. 1. Trial participants were Chinese women who participated in baseline, community-based surveys conducted in areas of Seattle and Vancouver with high proportions of Chinese residents during 1999. Women who were identified as underutilizers of Pap testing were randomly assigned to the outreach worker intervention, to the direct mail intervention, or to control status between 6 and 12 months after they participated in the baseline survey. Groups of women were randomly assigned every month over the 6-month period. Seattle and Vancouver participants were randomly assigned separately. Women in the experimental groups received the appropriate intervention within 1 month of random assignment. Control group participants received their usual care at local clinics and doctors' offices. The impact of the interventions was assessed by self-reported Pap testing behavior, ascertained through a follow-up survey 6 months following randomization and medical record review. This study was approved by the Institutional Review Boards of the Fred Hutchinson Cancer Research Center in Seattle and the University of British Columbia in Vancouver. Written informed consent was obtained from all participants.

Participant Recruitment and Assignment

Previous articles provide detailed descriptions of the baseline survey sampling, development, recruitment, and implementation methods *(18–20)*. Two methods were used to identify Chinese households in the target regions of the two cities: we linked a list of Chinese last names to local telephone directories and used commercially available listings of Chinese households from a marketing company. A questionnaire was developed that included questions about sociodemographic items, as well as questions related to Pap testing, mammography, hepatitis B, diet, smoking, and access to health care. All questionnaire items were developed in English, translated into Chinese, back-translated to English to ensure lexical equivalence, reconciled, and pre-tested *(21)*. Households received an introductory letter (in both Chinese and English) before any contact attempts were made by our survey workers. The questionnaires were administered in women's homes by female Chinese interviewers who spoke Cantonese, Mandarin, and English. The survey was completed by a total of 1532 Chinese women (710 in Seattle and 822 in Vancouver). The participation rates for the baseline survey in Seattle and Vancouver were 72% and 62%, respectively.

Women who completed the baseline survey were eligible for participation in the intervention trial if they were 20–69 years of age; spoke Cantonese, Mandarin, or English; had no history of invasive cervical cancer; had not received a hysterectomy; and were underutilizers of cervical cancer screening. Underutilizers were defined as women who indicated in their responses to the baseline survey that they had not had Pap testing in the last 2 years and/or did not intend to have a Pap test in the next 2 years. This criterion was consistent with British Columbia cervical cancer screening guidelines (i.e., women should receive Pap testing at 2 year intervals until age 70) and routine clinical practice in the Seattle area. The sample for the randomized controlled trial included 482 women (283 in Vancouver and 199 in Seattle). A computer program was used to randomly allocate each woman to one of the three study arms.

Interventions

Intervention materials—We used findings from a qualitative study (Jackson JC: unpublished data) to develop culturally and linguistically appropriate materials for use in both of the experimental interventions. These materials included an education–entertainment video (available in Cantonese and Mandarin, and with English subtitles), a motivational pamphlet, and fact sheets. We also included an educational brochure, developed by the Federation of

Chinese American and Canadian Medical Societies, which provides basic facts about cervical cancer and Pap testing. All written materials included both Chinese and English text.

Video is increasingly being used as a medium for health promotion and is particularly useful for cancer education in North American Asian immigrant communities because of high rates of videocassette recorder (VCR) ownership *(2,22).* We chose to use an education–entertainment (soap-opera) format for our video *(23).* Cultural context was provided by referring to traditional Chinese health practices (e.g., eating certain soups to prevent disease), recognizing the importance of events such as "milestone" birthdays in Chinese culture, and including footage of familiar scenes (e.g., a traditional herbalist store). Cervical cancer screening barriers identified by our qualitative work (Jackson JC: unpublished data) (e.g., beliefs concerning the necessity of Pap testing for asymptomatic, sexually inactive, and postmenopausal women) were systematically addressed in the video.

Culturally and linguistically appropriate print materials have been successfully used in disease prevention programs targeting minority groups and can enhance the effectiveness of video presentations *(22,24).* Therefore, we developed a motivational pamphlet featuring drawings of women by a Chinese artist. The pamphlet addressed barriers to cervical cancer screening (e.g., lack of physician recommendation) through testimonials from Chinese women and included a question and answer section. The fact sheets addressed linguistic and financial barriers to health care access and were tailored to Seattle and Vancouver, unlike the other materials. Specifically, the Seattle version provided information about clinics with Chinese language interpreter services and information about coverage of cervical cancer screening by public and private Washington State insurers. The Vancouver fact sheet listed Chinese Canadian physicians in Metropolitan Vancouver and included a statement indicating that the British Columbia Provincial Medical Service Plan pays for Pap testing.

Outreach worker intervention—The outreach worker intervention is summarized in Fig. 2. Women who were randomly assigned to the outreach worker intervention initially received Chinese and English versions of an introductory letter. Within 3 weeks, they were visited at home by one of four bicultural, trilingual (Cantonese, Mandarin, and English) Chinese female outreach workers. Women who refused a home visit were offered the educational materials. Ten attempts were made to contact each woman.

Following a model developed by the Community House Calls program, the outreach workers were trained to act as role models, to provide social support, and to serve as cultural mediators between women and health care facilities *(25).* They were also trained to use visual aids (e.g., a speculum and Pap testing kit) and provide tailored responses to each woman's individual barriers to cervical cancer screening *(26).* During each home visit, the outreach worker asked the woman if they could watch the video together. (Portable equipment was available for use in the small proportion of participant homes without VCRs.) If the woman preferred to watch the video at another time, a copy (in the appropriate language) was left at the home. In addition, each woman was provided with the project's printed materials. Finally, the outreach workers offered the following logistic assistance to women as necessary: clinic referral and assistance with appointment scheduling, medical interpreter services during clinic visits for Pap testing, and transportation assistance (i.e., taxicab transportation to and from clinic appointments or two bus passes).

About 1 month after the visit, outreach workers attempted to contact (by telephone) those women who did not report a recent Pap test during the home visit to see if Pap testing had been completed and to offer further assistance. As they had done at home visits, the outreach workers provided tailored responses to address the individual barriers of women who had not been screened *(26).* Additionally, logistic assistance was offered, if appropriate.

Direct mail intervention—Women in the direct mail arm of the study were mailed a packet that included Chinese and English versions of a cover letter, the education–entertainment video (in the language used to complete the baseline survey), motivational pamphlet, educational brochure, and fact sheet.

Data Collection

Follow-up survey—We attempted to survey all trial participants for a second time 6 months after random assignment. Items on the follow-up questionnaire were developed in English, translated into Chinese, back-translated to English to ensure lexical equivalence, reconciled, and pretested *(21).* Women received a letter (Chinese and English versions) informing them of the upcoming follow-up survey. All surveys were completed by bi-cultural (Chinese-American and Chinese-Canadian), trilingual (Mandarin, Cantonese, and English speaking) female interviewers who were unaware of participants' trial arm. Up to eleven attempts (including at least two evening and two weekend attempts) were made to contact participants for the follow-up survey. To trace women who had moved, we used contact information for friends and relatives provided at the time of the baseline survey, the U.S. National Change of Address System, and the most recent telephone books for Metropolitan Seattle and Vancouver. During the follow-up survey, women were asked if they had received Pap testing in the last 2 years and whether they planned to be screened in the next 2 years. Those who reported having had a Pap test in the last 2 years were also asked to provide information about the month and year of their last screening and information about the location of the clinic or doctor's office where testing was performed.

Medical record review—Women who reported cervical cancer screening in the previous 2 years were asked to sign a medical release form giving project staff permission to request medical record verification of their self-reported Pap test. In both cities, a copy of the last cytology report for the Pap smear was then requested from each woman's clinic or doctor's office by using a form that provided the woman's name, age, and self-reported date of testing. In Vancouver, health care facilities were also given each woman's Provincial Medical Service Plan number.

Process evaluation—Process evaluation generally focuses on specific activities and addresses actual delivery of services. Process data were therefore collected to document the implementation and content of the outreach intervention *(27).* Outreach workers routinely completed forms addressing the outcome (e.g., complete intervention received, partial intervention received, or no intervention received) of home visits and follow-up telephone call attempts, use of the video, and tailored logistic assistance provided to women.

Statistical Analysis

The primary outcome of the study was Pap testing in the 6-month interval between random assignment and follow-up survey completion. Secondary outcomes were Pap testing within the last 2 years and plans for Pap testing in the next 2 years. Analyses used both Pap testing self-report and medical record data. We conducted an "intent-to-treat" analysis of our intervention trial and included all randomly assigned women with follow-up data, regardless of whether they received their assigned intervention *(28).* We used chi-square tests to evaluate statistical significance with respect to differences in proportions *(29).* Unconditional logistic regression techniques were used to adjust for the following potential confounders: city (Seattle and Vancouver, for analyses using data from both cities), age group, educational level, housing type (i.e., owned, rented, or government subsidized, which is a proxy measure of income), marital status, proportion of life spent in North America (which is considered to be the best measure of acculturation), language preference, and ever screened for cervical cancer at baseline *(30,31).* All tests for statistical significance were two-sided.

Results

Study Group Characteristics

Follow-up data were available for 402 (83%) of the 482 randomly assigned women; (181 in Seattle and 221 in Vancouver) (Table 1). A greater proportion of Seattle women (91%) than Vancouver women (78%) completed the follow-up survey, the main difference being less mobility in Seattle (i.e., fewer women had moved or were untraceable). One hundred and twenty-nine (80%) of the 161 women assigned to the outreach group, 139 (86%) of the 161 women assigned to the direct mail group, and 134 (84%) of the 160 women assigned to the control group completed the follow-up survey. In Seattle, follow-up data were available for 59 (88%) of the 67 women assigned to the outreach worker group, 63 (95%) of the 66 women assigned to the direct mail group, and 59 (89%) of the 66 women assigned to the control group. Follow-up data were obtained from 70 (74%) of the 94 Vancouver women in the outreach worker arm, 76 (80%) of the 95 Vancouver women in the direct mail arm, and 75 (80%) of the 94 Vancouver women in the control arm. There were no statistically significant differences across the three trial arms in the proportions of women lost to follow-up in Seattle or Vancouver or among the study group as a whole (Table 2).

At baseline, 58% of the 402 women for whom follow-up data were available were aged 45 or older, 44% were high school graduates, 80% lived in homes that they or a family member owned, and 81% were currently married. Less than one half (44%) had lived in North America for at least 25% of their life. The majority (77%) completed their baseline survey in Cantonese. At the time of the baseline survey, 51% of the women reported they had received Pap testing, 13% had been screened in the last 2 years, and 35% planned to be screened in the next 2 years. There were no statistically significant differences between the outreach worker intervention, the direct mail intervention, and the control arms with respect to these characteristics in either city or among women from both cities combined (Table 2). However, the Vancouver participants were statistically significantly younger ($P<.001$), more highly educated ($P<.001$), and more likely to be planning Pap testing in the next 2 years ($P = .006$) than were the Seattle participants.

Outcome Evaluation

The proportions of women reporting Pap testing in the interval between randomization and follow-up data collection, screening in the last 2 years, and plans for screening in the next 2 years are given in Table 3. Fifty (39%) of the 129 women with follow-up data who were randomly assigned to the outreach worker intervention reported Pap testing in the 6 months between randomization and follow-up survey completion. In the direct mail arm, 35 (25%) of the 139 women with follow-up data reported Pap testing following randomization. Twenty (15%) of the 134 control women with follow-up data reported they had been screened during the same 6-month interval. All three of the pair-wise comparisons were statistically significant. Sixty-one percent of women in the outreach worker arm, 47% of women in the direct mail arm, and 34% of women in the control arm had completed Pap testing in the last 2 years. Statistical comparisons for outreach worker versus control, direct mail versus control, and outreach worker versus direct mail were statistically significant. Seventy-two percent of the outreach worker group, 59% of the direct mail group, and 48% of the control group were planning Pap testing in the next 2 years. Again, all the pair-wise comparisons were statistically significant (Table 3).

To analyze the Pap testing self-report data for the effects of potential confounding variables, we next carried out a multiple regression analysis in which we adjusted for variables such as age and education. The results of the multivariate analyses are summarized in Table 4. The

adjustment for potentially confounding variables did not meaningfully alter the findings from the bivariate analyses.

To determine the accuracy of the Pap test self-report, we asked the women for consent to review their medical records in an attempt to confirm Pap testing in the interval between randomization and the follow-up survey. Among the 190 (94 in Seattle and 96 in Vancouver) women who reported Pap testing in the last 2 years, seven Seattle women and 11 Vancouver women did not sign the medical release form allowing the project to request their cervical cancer screening medical records or did not provide sufficient information about the clinic where testing was performed for us to contact the clinic. These women were similarly distributed across the three study arms (data not shown). Table 5 gives the outcome of our medical record requests. We were able to confirm Pap testing within the last 2 years for a higher proportion of Vancouver women than Seattle women. The discrepancy between the two study cities was largely attributable to the higher proportion of Seattle clinics reporting no record of Pap testing or no record of a patient.

Asian naming systems can result in misfiling of test results, and therefore, difficulty finding medical records. It is likely, therefore, that at least some of the Seattle women whose self-reported recent Pap testing could not be verified had, in fact, received a recent Pap test. In Seattle, clinics were only given the patient's name and age, whereas in Vancouver, clinics were also given each woman's unique British Columbia Medical Service Plan number. Considering these factors, we repeated our analyses with respect to Pap testing in the interval between random assignment and follow-up data collection, as well as in the last 2 years by using a conservative approach in which we assumed that women who did not sign the medical release form or those who supplied insufficient provider information had not been screened in the last 2 years and that clinics were correct in stating they had no record of those patients or records of their recent Pap testing.

Although Pap testing rates were lower in this conservative analysis (data not shown) than those shown in Table 3, we were still able to demonstrate intervention effects. For Pap testing in the interval between randomization and follow-up data collection in the study group as a whole, comparisons were as follows: outreach worker versus control ($P<.001$), direct mail versus control ($P = .07$), and outreach worker versus direct mail ($P = .04$). The following comparisons were statistically significant for Pap testing in the last 2 years: outreach worker versus control ($P<.001$) and direct mail versus control ($P = .03$).

To account for the effects of potential confounding variables on the findings of the medical record review, we used multiple regression analysis to analyze the data. After adjustment for potentially confounding variables, the three pairwise comparisons for Pap testing following random assignment were statistically significant or approached statistical significance (outreach worker versus control ($P<.001$), direct mail versus control ($P = .05$), outreach worker versus direct mail ($P = .06$). Comparisons for outreach worker versus control ($P<.001$) and direct mail versus control ($P = .02$) also remained statistically significant with respect to screening in the last 2 years.

Process Evaluation

For the 161 women who were initially randomly assigned to the outreach worker intervention, more than three quarters (76%) of attempted visits were completed. Sixty-seven percent of the attempted Vancouver home visits were completed compared with 88% of the attempted Seattle home visits. Another 14% of the women (4% in Seattle and 20% in Vancouver) refused a home visit but accepted the educational materials. The remaining 11% either refused the visit and materials (2%), could not be contacted after 10 attempts (4%), or had moved and were untraceable (5%).

Eighty-seven percent of women who completed home visits watched the education–entertainment video (85% in Seattle and 89% in Vancouver), 12% were given a referral to a clinic and/or assistance with scheduling an appointment (19% in Seattle and 6% in Vancouver), and 2% accepted transportation assistance (2% in each city). Finally, 14% of Seattle women accepted medical interpreter services at clinic visits compared with 0% of Vancouver women. Nearly all (97%) of attempted follow-up telephone calls were completed in both cities. Only one of the direct mailings in each city was returned by the post office as undeliverable.

Discussion

We evaluated two alternative Pap testing interventions for North American Chinese women and found both interventions to be effective in changing cervical cancer screening behavior. However, it should be noted that the likelihood of receiving Pap testing in the interval after women were randomly assigned was statistically significantly improved among the direct mail group only when the intervention was assessed by self-report and not when it was assessed by medical record review. We also found that the outreach worker intervention effect, with respect to Pap testing in the interval following randomization, was statistically significant in Vancouver but not in Seattle and that the direct mail intervention was effective only in Vancouver. These differential effects may be due, in part, to the higher rate of Pap testing in the control arm in Seattle. Several factors may have contributed to the discrepancies in our Seattle and Vancouver results. The Centers for Disease Control and Prevention Breast and Cervical Cancer Control Program has actively targeted Chinese women in Seattle throughout our study period. This program may have resulted in higher Pap testing rates among Seattle controls and, therefore, a smaller effect of the outreach worker intervention. Additionally, the education–entertainment video was filmed in Vancouver, and local scenes may have made it more appealing to the Canadian participants.

Our results are similar to those of McAvoy and Raza *(12),* who conducted a randomized controlled trial to evaluate the effects of health education on the uptake of cervical cancer screening among non-English speaking women originally from the Indian subcontinent living in Leicester, England. Women with no record of Pap testing were randomly assigned to one of three experimental groups or control status. Nearly one half (47%) of women who were shown an education–entertainment video during a home visit by a bicultural, bilingual outreach worker adhered to screening recommendations compared with 37% who were visited and only given an educational leaflet. In contrast, only 5% of women who were not contacted and 11% of women who were sent a leaflet in the mail completed a Pap test. As in our study, only one quarter of the women who were randomly assigned to receive a home visit refused intervention *(12).*

Differences in our process evaluation results between Seattle and Vancouver probably reflect either transient or inherent differences between the two cities. Process evaluation indicated that home visits by outreach workers were more acceptable to Chinese women in Seattle than to those in Vancouver. However, the study was conducted during a time when Vancouver was experiencing a sharp increase in crime rates, particularly with respect to home invasions and residential burglaries. Although a greater proportion of Vancouver women than Seattle women preferred not to complete educational sessions with an outreach worker, few refused to accept the project materials. Seattle women were more likely than those in Vancouver to receive logistic assistance in the form of clinic referral, appointment scheduling, and medical interpreter services during clinic visits. These findings might be expected because Vancouver residents nearly all have a primary care provider. Additionally, many Vancouver physicians and other clinic staff are of Chinese descent and speak Cantonese and/or Mandarin. Finally, very few women in either city accepted transportation assistance in the form of bus passes or

taxicab fares. Potential reasons for the low usage may include concerns about using public transportation among women who had limited English-speaking ability.

Our study has several limitations. First, we recruited women living in areas with a high proportion of recent Chinese immigrants and the results may, therefore, not be generalizable to all Chinese-Americans and Chinese-Canadians. Second, only women who agreed to complete a baseline survey were eligible for participation in the trial; survey nonresponders may be less likely to be receptive to intervention programs than are responders. Third, although we requested the medical records of women who reported cervical cancer screening in the last 2 years, we made no attempt to verify the accuracy of self-reports among women who reported that they had not been screened recently; some of these women may have been unaware that they had received a Pap smear during a pelvic examination. Fourth, we evaluated two multifaceted interventions, and our study design precluded an assessment of the individual and interactive intervention components (e.g., of the education–entertainment video and pamphlet). Finally, we were not able to adjust for access to health care among Seattle participants. Lack of access may be a significant barrier to Pap testing, even among motivated women.

In summary, we found that culturally and linguistically appropriate outreach and direct mail interventions can be effective in enhancing cervical screening participation among Chinese women in North America. These interventions could be incorporated into the ongoing activities of the U.S. Breast and Cervical Cancer Control Program. Our results also suggest that the acceptability and effectiveness of these interventions may vary among Chinese communities and/or health care systems in North America. Therefore, these interventions should be evaluated in other geographic areas of North America with Chinese populations.

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Fig. 1.
Overview of study design.

Fig. 2.
Summary of outreach worker intervention.

Table 1

Response to follow-up survey

Final survey disposition	Study group		
	Seattle (N = 199)* n (%)	Vancouver (N = 283)† n (%)	All randomly assigned women (N = 482)‡ n (%)
Survey completed	181 (91)	221 (78)	402 (83)
Refused to complete survey	12 (6)	22 (8)	34 (7)
No contact after 11 attempts	0 (0)	6 (2)	6 (1)
Moved and unable to trace	6 (3)	34 (12)	40 (8)

* Outreach worker, n = 67; direct mail, n = 66; control, n = 66.

† Outreach worker, n = 94; direct mail, n = 95; control, n = 94.

‡ Outreach worker, n = 161; direct mail, n = 161; control, n = 160.

Table 2

Baseline characteristics of women with follow-up data

Characteristic	Trial arm			All randomly assigned women (N = 402) n (%)
	Outreach worker intervention (N = 129) n (%)	Direct mail intervention (N = 139) n (%)	Control (N = 134) n (%)	
City				
Seattle	59 (46)	63 (45)	59 (44)	181 (45)
Vancouver	70 (54)	76 (55)	75 (56)	221 (55)
Age, y				
20–44	61 (47)	52 (37)	56 (42)	169 (42)
45–69	68 (53)	87 (63)	78 (58)	233 (58)
Education, y				
<12	74 (57)	83 (60)	67 (50)	224 (56)
12+	55 (43)	56 (40)	67 (50)	178 (44)
Home ownership				
Yes	109 (84)	111 (80)	102 (76)	322 (80)
No	20 (16)	28 (20)	32 (24)	80 (20)
Currently married				
Yes	100 (78)	113 (81)	112 (84)	325 (81)
No	29 (22)	26 (19)	22 (16)	77 (19)
Proportion of life in North America (%)				
<25	70 (54)	82 (59)	72 (54)	224 (56)
25+	59 (46)	57 (41)	62 (46)	178 (44)
Language preference*				
Cantonese	103 (80)	105 (76)	103 (77)	311 (77)
Mandarin	22 (17)	30 (22)	25 (19)	77 (19)
English	4 (3)	4 (3)	6 (4)	14 (3)
Ever received a Pap test				
Yes	73 (57)	72 (52)	61 (46)	206 (51)
No/not sure	56 (43)	67 (48)	73 (54)	196 (49)
Pap testing in last 2 years				
Yes	21 (16)	16 (12)	17 (13)	54 (13)
No/not sure	108 (84)	123 (88)	117 (87)	348 (87)
Planning Pap testing in next 2 years				
Yes	44 (34)	54 (39)	41 (31)	139 (35)
No/not sure	85 (66)	85 (61)	93 (69)	263 (65)

*Language used to complete baseline survey.

Table 3

Self-reported Pap testing behavior of women who completed follow-up surveys*

Pap testing variable	Seattle (N = 181) %	Vancouver (N = 221) %	All women (N = 402) %
Pap testing in interval between randomization and follow-up survey			
Outreach worker arm	37†	40‡	39§
Direct mail arm	22	28	25
Control arm	22	9	15
Pap testing in last 2 years			
Outreach worker arm	69‖	54¶	61#
Direct mail arm	48	46	47
Control arm	39	31	34
Planning Pap testing in next 2 years			
Outreach worker arm	71**	73††	72‡‡
Direct mail arm	52	65	59
Control arm	51	45	48

*All chi-square tests for statistical significance were two-sided.

†Outreach worker versus control, $P = .07$; direct mail versus control, $P = .98$; outreach worker versus direct mail, $P = .07$.

‡Outreach worker versus control, $P<.001$; direct mail versus control, $P = .004$; outreach worker versus direct mail, $P = .11$.

§Outreach worker versus control, $P<.001$; direct mail versus control, $P = .03$; outreach worker versus direct mail, $P = .02$.

‖Outreach worker versus control, $P<.001$; direct mail versus control, $P = .34$; outreach worker versus direct mail, $P = .01$.

¶Outreach worker versus control, $P = .004$; direct mail versus control, $P = .05$; outreach worker versus direct mail, $P = .32$.

#Outreach worker versus control, $P<.001$; direct mail versus control, $P = .04$; outreach worker versus direct mail, $P = .02$.

**Outreach worker versus control, $P = .03$; direct mail versus control, $P = .87$; outreach worker versus direct mail, $P = .04$.

††Outreach worker versus control, $P<.001$; direct mail versus control, $P = .01$; outreach worker versus direct mail, $P = .33$.

‡‡Outreach worker versus control, $P<.001$; direct mail versus control, $P = .05$; outreach worker versus direct mail, $P = .03$.

Table 4

Multiple regression results for self-reported Pap testing behavior*

Pap testing variable	Seattle (N = 181) OR (95% CI)	Vancouver (N = 221) OR (95% CI)	All women (N = 402) OR (95% CI)
Pap testing in interval between randomization and follow-up survey			
Outreach worker arm	2.0 (0.9 to 4.7)†	7.0 (2.8 to 19.3)‡	3.5 (1.9 to 6.6)§
Direct mail arm	1.0 (0.4 to 2.6)	4.0 (1.6 to 11.1)	2.0 (1.1 to 3.7)
Control arm	1.0	1.0	1.0
Pap testing in last 2 years			
Outreach worker arm	3.6 (1.6 to 8.2)‖	3.3 (1.6 to 7.3)¶	3.3 (1.9 to 5.7)#
Direct mail arm	1.5 (0.7 to 3.4)	2.2 (1.1 to 4.7)	1.7 (1.0 to 2.9)
Control arm	1.0	1.0	1.0
Planning Pap testing in next 2 years			
Outreach worker arm	2.3 (1.0 to 5.3)**	4.2 (1.9 to 9.7)††	3.0 (1.7 to 5.3)‡‡
Direct mail arm	1.0 (0.5 to 2.2)	2.8 (1.3 to 5.9)	1.6 (0.98 to 2.8)
Control arm	1.0	1.0	1.0

* All tests for statistical significance were two-sided. OR = odds ratio; CI = confidence interval.

† Outreach worker versus control, $P = .10$; direct mail versus control, $P = .93$; outreach worker versus direct mail, $P = .12$.

‡ Outreach worker versus control, $P<.001$; direct mail versus control, $P = .02$; outreach worker versus direct mail, $P = .14$.

§ Outreach worker versus control, $P<.001$; direct mail versus control, $P = .03$; outreach worker versus direct mail, $P = .03$.

‖ Outreach worker versus control, $P = .002$; direct mail versus control, $P = .30$; outreach worker versus direct mail, $P = .03$.

¶ Outreach worker versus control, $P<.002$; direct mail versus control, $P = .03$; outreach worker versus direct mail, $P = .27$.

Outreach worker versus control, $P<.001$; direct mail versus control, $P = .04$; outreach worker versus direct mail, $P = .02$.

** Outreach worker versus control, $P = .05$; direct mail versus control, $P = .99$; outreach worker versus direct mail, $P = .05$.

†† Outreach worker versus control, $P<.001$; direct mail versus control, $P = .005$; outreach worker versus direct mail, $P = .30$.

‡‡ Outreach worker versus control, $P<.001$; direct mail versus control, $P = .06$; outreach worker versus direct mail, $P = .03$.

Table 5

Outcome of medical record requests*

Outcome	Seattle (N = 94) n (%)	Vancouver (N = 96) n (%)	All requests (N = 190) n (%)
Cytology report received confirming Pap testing in last 2 years	63 (67)	77 (80)	140 (74)
Cytology report received indicating last Pap testing performed over 2 years ago	5 (5)	6 (6)	11 (6)
Clinic reported no record of Pap testing	14 (15)	1 (1)	15 (8)
Clinic reported no record of patient	5 (5)	1 (1)	6 (3)
Cytology report not requested†	7 (7)	11 (11)	18 (9)

*Among women who self-reported Pap testing in the last 2 years.

†Women who did not sign medical release or provided insufficient information about clinic.