

Cervical and Breast Cancer Screening After CARES: A Community Program for Immigrant and Marginalized Women



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Introduction: Marginalized populations such as immigrants and refugees are less likely to receive cancer screening. Cancer Awareness: Ready for Education and Screening (CARES), a multifaceted community-based program in Toronto, Canada, aimed to improve breast and cervical screening among marginalized women. This matched cohort study assessed the impact of CARES on cervical and mammography screening among under-screened/never screened (UNS) attendees.

Methods: Provincial administrative data collected from 1998 to 2014 and provided in 2015 were used to match CARES participants who were age eligible for screening to three controls matched for age, geography, and pre-education screening status. Dates of post-education Pap and mammography screening up to June 30, 2014 were determined. Analysis in 2016 compared screening uptake and time to screening for UNS participants and controls.

Results: From May 15, 2012 to October 31, 2013, a total of 1,993 women attended 145 educational sessions provided in 20 languages. Thirty-five percent (118/331) and 48% (99/206) of CARES participants who were age eligible for Pap and mammography, respectively, were UNS on the education date. Subsequently, 26% and 36% had Pap and mammography, respectively, versus 9% and 14% of UNS controls. ORs for screening within 8 months of follow-up among UNS CARES participants versus their matched controls were 5.1 (95% CI=2.4, 10.9) for Pap and 4.2 (95% CI=2.3, 7.8) for mammography. Hazard ratios for Pap and mammography were 3.6 (95% CI=2.1, 6.1) and 3.2 (95% CI=2.0, 5.3), respectively.

Conclusions: CARES' multifaceted intervention was successful in increasing Pap and mammography screening in this multiethnic under-screened population.

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INTRODUCTION

Population screening for cervical and breast cancers reduces related morbidity and mortality. Ontario, Canada's most populous province, has organized cervical and breast cancer screening programs and universal health insurance covers the cost of screening for residents. Nevertheless, inequities in screening participation persist; screening rates are lower in newcomer women, especially those of South Asian origin, and women who are older, of low SES, in poorer health, or otherwise marginalized.^{1–7} In 2006–2008, almost half

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of female immigrants living in Canada's largest city, Toronto, were under-screened or never screened (UNS) for cervical cancer.² A population-based study of Ontario women found that 57% of women immigrating since 1985 were up to date with mammography versus 66% of long-term residents, both well below the Canadian target of 70%.⁸

Reasons cited for newcomers' low screening participation include lack of knowledge, limited language-specific resources, difficulty navigating the healthcare system to access screening, and competing life demands.^{9–13} When individuals face poverty, unemployment, and food or housing insecurity, cancer screening is unlikely to be a priority unless it is perceived as important, acceptable, and easy to do. Cultural beliefs such as fatalism, lack of perceived vulnerability, and unfamiliarity with the concept of screening also influence screening practices.^{4,9–15}

Cancer Awareness: Ready for Education and Screening (CARES) was a multifaceted intervention developed to increase knowledge and screening for breast and cervical cancer among newcomer and other marginalized women in Toronto.¹⁶ CARES was developed based on the Ecologic Model framework of McLeroy et al.,^{17,18} which recognizes multiple levels of interacting influences on health behaviors. CARES specifically addressed individual, interpersonal, institutional, and community barriers/facilitators to screening in order to meet the needs of Toronto's diverse population ([Appendix Figure 1](#), available online). CARES components included:

1. outreach to target groups through a network of community agencies and peer leaders;
2. language-specific group educational sessions co-facilitated by peer leaders in familiar community settings;
3. facilitated access to screening (i.e., group visits with language support, health bus for Pap testing, help with appointment bookings and transportation); and
4. follow-up phone calls to reinforce screening messages and support intention to screen.

In this study, administrative data were used to assess the impact of CARES on cervical (Pap) and mammography screening among UNS attendees.

METHODS

Study Population

With a population of 2.8 million, Toronto is one of the world's most diverse cities; half of its population is foreign born, and half of newcomers immigrated within the previous 15 years. Just over 30% of Toronto residents speak a language other than English or

French at home.¹⁹ CARES recruited participants through a network of community agencies serving refugees, immigrants, low-income and under-housed women, or located in neighbourhoods with significant populations of these target groups. Agencies included community centers, social service agencies, refugee centers, shelters, and public libraries.

A matched cohort study of screening-eligible CARES participants and controls matched 1:3 for age, geography, and pre-education screening status was used to compare Pap and mammography screening post-education among those who were UNS. Ontario cancer screening guidelines recommend cervical screening every 3 years for women aged 21–69 years, and mammography every 2 years for women aged 50–74 years.^{20,21} Four study cohorts were created:

1. CARES and control Pap cohorts included women aged 21–69 years; and
2. CARES and control mammography cohorts included women aged 50–74 years.

Women aged 50–69 years were thus present in both screening cohorts. For both Pap and mammography, individuals not screened within 36 months were considered UNS. This study was approved by the Research Ethics Boards of Women's College and St. Michael's Hospitals, Toronto.

From May 15, 2012 until October 31, 2013, the CARES program, delivered language-specific group education sessions, co-facilitated by community-based peer leaders and CARES program staff. Sessions were promoted through flyers at community agencies, personal invitation from peer leaders and partner agency staff, and word of mouth. Public transit fares, child care, and snacks were provided to promote attendance. Community partners helped to identify potential peer leaders whose role was to assist with recruitment, co-facilitate educational sessions, provide accompaniment to group screening, conduct follow-up phone calls, and liaise with the community. Forty-two peer leaders, who collectively spoke 24 languages, attended a 3-day training session that included content about cervical and breast cancers and cancer screening, peer leader roles and boundaries, adult learning principles, communication and group facilitation skills, woman-centered decision making, cross-cultural sensitivity, time management, challenging situations, and research documentation. CARES staff provided ongoing mentorship, either face-to-face after sessions or by telephone, in response to observed or peer leader-identified concerns.

Educational materials consisted of a simple PowerPoint presentation that engaged women to consider what they do to stay healthy (e.g., healthy eating, exercising regularly, avoiding smoking) and provided information about cervical and breast cancer screening. Content was developed from guidelines and public media messages produced by Cancer Care Ontario (CCO), the provincial agency overseeing organized cancer screening, and the Canadian Cancer Society, a national charitable organization focused on the eradication of cancer, as well as communication with leads of other projects that promoted cancer screening for newcomers.²² Slides contained visual imagery with simple English text. Peer leaders shared the content orally in the language of the group. After the educational session, women age eligible for screening who indicated they were not up to date were offered assistance with screening. Pap screening was offered through a

health bus, onsite clinic, or group visits to a collaborating hospital sexual health clinic, and mammography through individual appointments at community mammography sites, or group visits at hospital mammography units. Women were also encouraged to see their primary care provider for screening, if they had one. If they agreed, UNS women who did not register for screening were contacted several months later by the peer leader to encourage and facilitate screening.

Measures

At the beginning of educational sessions, participants were asked for consent to obtain anonymous information about their cancer screening activity by matching their name, Ontario Health Insurance Plan (OHIP) number, address, and date of birth to health administrative databases. In Ontario's universal health care system, the OHIP number is presented and recorded at every medical visit. Controls were not contacted nor did they give consent. Anonymized Pap and mammography data collected from 1998 to 2014 for CARES and control cohorts were obtained in 2015 through CCO, which collects such data for all Ontario women with an OHIP number.

Using participants' education session date, their most recent Pap and mammography dates pre-education and first screening post-education were determined. Follow-up continued until June 30, 2014, such that the shortest and longest follow-up periods were approximately 8 and 25 months, respectively. CCO data include Paps processed in community laboratories, but not in hospital-affiliated laboratories that processed many Paps provided by CARES. Although CARES-provided Paps were tracked, only those ascertained through CCO databases were included in the analysis. For control cohort matching, CARES participants were categorized according to screening status prior to education as:

1. never screened;
2. screened within 0–36 months (up to date); or
3. screened >36 months prior to the intervention (under-screened).

Age was categorized in increments of 10 years from 21–69 to 50–74 years for the Pap and mammography cohorts, respectively.

The sampling scheme used three controls to one CARES participant matched on pre-education screening status, age, and dissemination area, the smallest geographic unit used in the Canadian census, usually consisting of 400–700 people. For the control groups, the median CARES education date was used as the "intervention" date for matching pre-education screening status and to define the follow-up period. Controls were randomly sampled from a group who matched on unique matching combinations to achieve the required number (3:1). Neighborhood income quintile was calculated based on residential postal code using a census-based conversion file. Material deprivation and ethnic concentration (proportion of recent immigrants and self-identified visible minorities residing in a neighborhood) dimensions of the Ontario Marginalization Index were calculated based on the individual's dissemination area of residence.²³

Statistical Analysis

Descriptive statistics (contingency tables, counts, and percentages) were used to investigate associations between participation in the

CARES program and screening uptake during 8 months of follow-up (the longest follow-up period available for all subjects) and until the end of the study period. Magnitude of the association was quantified with ORs, using logistic generalized estimating equation models for point/interval estimates and hypothesis tests to account for the clustering of data as matched sets. To examine whether the intervention influenced time to Pap/mammography, Kaplan-Meier plots and an extended version of Cox regression were used to account for the matched/clustered nature of the data.²⁴ Hazard ratios, 95% CIs, and *p*-values from the fitted Cox regression model were estimated. Analyses were performed in 2016 using SAS, version 9.4.

RESULTS

During the study period, 1,993 women attended 145 educational sessions provided in 20 languages, held in 66 community sites throughout Toronto. Follow-up phone calls were made to 218 women, 161 Pap smears were provided through CARES, and 88 mammograms were facilitated. Of 623 CARES participants providing consent to access their screening data, 419 were matched successfully to CCO data. The remaining 204 could not be matched owing to incomplete identifiers. After excluding 42 who were screening ineligible based on age and five whose dissemination areas were indeterminate, 372 remained in the CARES cohort, with 331 and 206 age eligible for Pap and mammography, respectively. Most were successfully matched 1:3 with controls, although 3%–5% could only be matched 1:2 or 1:1, resulting in a total of 969 and 603 matched controls for Pap and mammography, respectively. Characteristics were well balanced across the CARES and control groups (data not shown).

Table 1 describes the characteristics of the CARES Pap and mammography cohorts. Most women attended non-English sessions, with Chinese being the most common language. Most lived in low-income, high-deprivation neighborhoods with high proportions of recent immigrants and visible minorities. Thirty-five percent (118/331) of participants were UNS for Paps and 25% (83/331) had no previous screening. For mammography, 48% (99/206) were UNS and 41% (84/206) had no previous recorded screening.

Among UNS CARES participants, 26% (31/118) and 36% (36/99) had Pap and mammography, respectively, by the end of the study period, as compared with 9% (30/344) and 14% (39/287) of the control group (Table 2). ORs for screening within 8 months of follow-up among UNS CARES participants compared with their controls were 5.1 (95% CI=2.4, 10.9) for Pap and 4.2 (95% CI=2.3, 7.8) for mammography. For Pap screening, the effect of CARES was most noticeable among never screened women, who had an OR of 13.3 (95% CI=4.0,

Table 1. Characteristics of CARES Participants

Characteristic	Pap-eligible group (21–69 yrs) (N=331)	Mammography-eligible group (50–74 yrs) (N=206)
Age (years)		
Mean	49.3	61.9
21–29	16 (1.3)	—
30–39	57 (17.2)	—
40–49	93 (28.1)	—
50–59	85 (25.7)	85 (41.3)
60–69	80 (24.8)	80 (38.8)
70–74	—	41 (19.9)
Language of session attended		
English	77 (23.3)	32 (15.5)
South Asian ^a	73 (22.1)	40 (19.4)
South East Asian ^b	42 (12.7)	37 (17.0)
Chinese ^c	92 (27.8)	73 (35.4)
Farsi/Dari/Arabic	23 (7.0)	7 (3.4)
Spanish/Portuguese	22 (6.7)	17 (8.3)
Other	^d (0.6)	0
Neighborhood income quintile		
Quintile 1 (lowest)	193 (58.3)	116 (56.3)
Q2	62 (18.7)	39 (18.9)
Q3	28 (8.5)	22 (10.7)
Q4	22 (6.7)	10 (4.9)
Q5	22 (6.7)	15 (7.3)
Missing	^d	^d
Neighborhood deprivation index		
Quintile 1 (lowest deprivation)	26 (8.2)	13 (6.9)
Q2	25 (7.8)	14 (7.4)
Q3	43 (13.5)	27 (14.2)
Q4	78 (24.5)	52 (27.4)
Q5	147 (46.1)	84 (44.2)
Neighborhood ethnic concentration		
Quintile 1 & Q2 (lowest concentration)	^d (2.6)	6 (3.2)
Q3	6 (5.0)	8 (4.2)
Q4	40 (12.5)	27 (14.2)
Q5	258 (80.1)	149 (78.4)
Pap screening pre-education		
0–36 months	213 (64.4)	—
> 36 months	35 (10.6)	—
Never	83 (25.1)	—
Mammography screening pre-education	—	
0–36 months	—	107 (51.9)
> 36 months	—	15 (7.3)
Never	—	84 (40.8)

Note: Data are shown as *n* (%).

^aSouth Asian (Bengali/Urdu/Punjabi/Hindi/Tamil).

^bEast Asian (Vietnamese/Khmer/Karen).

^cChinese (Mandarin/Cantonese).

^dNumber suppressed due to cell size < 6.

CARES, Cancer Awareness Ready for Education and Screening.

Table 2. Post Education Screening among Under/Never-screened and Never Screened Women

Baseline screening status	8-Month follow-up				Follow-up to end of study period June 30, 2014		
	CARES n (%)	Control n (%)	Effect size % (95% CI)	OR ^a (95% CI)	CARES n (%)	Control n (%)	OR ^a (95% CI)
Pap							
UNS	21/118 (18)	14/344 (4)	14 (6–21)	51 (2.4–10.9)	31/118 (26)	30/344 (9)	3.7 (2.1–6.6)
Never screened	15/83 (18)	^b (2)	16 (8–25)	13.3 (4.0–44.1)	21/83 (25)	15/239 (6)	5.1 (2.6–10.0)
Mammography							
UNS	29/99 (29)	25/287 (9)	20 (11–30)	4.2 (2.3–7.8)	36/99 (36)	39/287 (14)	3.6 (2.1–6.3)
Never screened	24/84 (29)	20/249 (8)	21 (10–31)	4.5 (2.3–8.9)	31/84 (37)	32/249 (13)	4.0 (2.2–7.1)

^aORs and 95% CIs calculated using a logistic generalized estimating equation model with assumed compound symmetric working correlation structure to account for fact that CARES/controls are clustered within matched sets.

^bNumber suppressed due to cell size < 6.

CARES, Cancer Awareness Ready for Education and Screening; UNS, under/never-screened.

44.1) for screening within 8 months. Hazard ratios for Pap and mammography were 3.6 (95% CI=2.1, 6.1) and 3.2 (95% CI=2.0, 5.3), respectively. Kaplan–Meier curves of the cumulative incidence of screening show the attenuation of the effect of CARES over time (Figure 1).

Stratified analysis was used to examine the effect of age, neighborhood income, and deprivation index on uptake of screening for previously UNS women in CARES and control groups. Age modified the effect of CARES on both Pap and mammography uptake; older women in the CARES cohort were less likely than their

younger counterparts to be screened post-education; this pattern was not seen in the control group (Table 3). Neighborhood income and deprivation index had no discernable effect on screening outcomes, although cell sizes were very small for the highest-income, least-deprived neighborhoods (data not shown).

To examine the possibility that the positive effect seen with CARES was actually due to screening initiation by participants who were previously UNS by virtue of age, (i.e., becoming age eligible for screening), a sensitivity analysis excluding women aged <24 years and <53

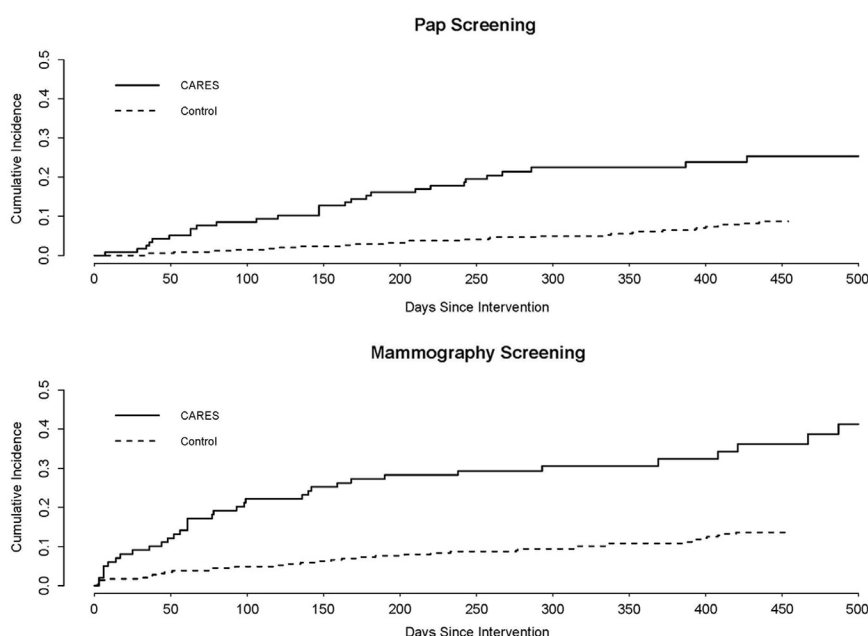


Figure 1. Cumulative incidence of Pap and mammography screening. CARES, Cancer Awareness: Ready for Education and Screening.

Table 3. Post-Education Pap and Mammography Screening in Under/Never-screened Women by Age Category

Age group	21–29	30–39	40–49	50–59	60–69	70–74
<i>n</i> (%) screened with Pap						
CARES	0/8 (0)	11/21 (52.4)	9/30 (30.0)	^a (20.0)	7/39 (18.0)	-
Control	0/24 (0)	^a (8.6)	8/90 (8.9)	^a (7.0)	13/115 (11.3)	-
<i>n</i> (%) screened with mammogram						
CARES	-	-	-	19/44 (43.2)	13/31 (41.9)	^a (16.7)
Control	-	-	-	19/127 (15.0)	14/92 (15.2)	6/68 (8.8)

^aNumber suppressed due to cell size < 6.

CARES, Cancer Awareness: Ready for Education and Screening.

years for the Pap and mammogram analyses, respectively, was conducted and found no difference in outcomes (data not shown).

DISCUSSION

This matched cohort study demonstrates the impact of a multifaceted, community-based intervention on both Pap and mammography screening in a diverse, predominantly immigrant, urban population. In the 8 months following education sessions, UNS CARES participants were significantly more likely to be screened than their matched controls: five and four times more likely for Pap and mammography, respectively. This effect persisted but was attenuated over time, suggesting that reinforcement of screening messages and continued screening facilitation for women needing more time to decide could boost the longer-term impact of such interventions. Ontario's universal health insurance greatly reduced the influence of cost barriers on study findings.

Previous community interventions to improve cancer screening among under-screened populations have shown variable success.^{4,25–31} In systematic reviews effect sizes averaged 16% for Pap screening and 7.8% for mammography,^{26,27} similar to CARES' effect size of 14% for Pap screening, but significantly lower than the 20% for mammography. Notably, most studies have relied on self-report to measure screening or used intention to screen to assess impact.^{32–35} A key strength of this study was the accurate measurement of cancer screening using administrative data rather than self-report, which tends to overestimate screening and varies with ethnicity.^{36–38} Groups were well matched on age, screening history, and small geographic area of residence and the analysis was able to demonstrate the impact of CARES on screening over time, which provides useful information for planning future interventions.

Among interventions that promote cancer screening in minority or immigrant populations, those such as CARES that are multifaceted and underpinned by a theoretic framework to address multiple barriers have

shown the greatest effect on screening uptake.^{27,39,40} The ENCORE^{plus} program used community networks and an ecologic approach similar to CARES to address multiple environmental and personal barriers to breast and cervical screening for underserved women across the U.S.⁴¹ Among their cohort of 27,494 UNS women, 58% reported receiving a mammogram and 37% reported receiving a Pap test within 6 months of the program. However, ENCORE measured screening through self-report, defined under-screened status as no Pap or mammogram within 1 or 2 years, respectively, had no control group, and reached a largely uninsured population who nevertheless had high baseline rates of past screening (81% ever screened for mammography and 91% ever screened for Pap). By contrast, CARES UNS participants had no screening within 3 years, most having never been screened.

This study adds to the literature that peer leaders or "lay health educators" can be effective in overcoming language and cultural barriers to preventive care experienced by immigrant and minority populations.^{30,31,39,40} Greatest effects have been noted when lay educators were racially or ethnically similar to the target group, as was the case for CARES peer leaders.⁴⁰ CARES peer leaders also supported system navigation, linking women interested in screening with services, and providing linguistic support and accompaniment to group screening sessions. A systematic review found that 14/15 studies that used patient navigators to bridge language barriers improved mammography and cervical screening, by 17%–25% and 60%, respectively.⁴² In a qualitative evaluation of CARES, women specifically cited language support provided by peer leaders during screening visits as crucial.¹⁶ Furthermore, CARES peer leaders described the positive impact of being a peer leader on their personal development, an added benefit that increases sustainability of such outreach programs and builds community capacity.⁴³

The results suggest that CARES' impact was greater for women who had no prior screening. A U.S. randomized trial of one-on-one lay worker cervical cancer screening education with Vietnamese-born women showed an

increase in screening only in previously screened women⁴⁴; however, another study of Vietnamese-born women that added facilitation to screening after peer-led group education, similar to CARES, significantly increased Pap tests among both never and previously screened women.⁴⁵ The authors postulate that system navigation plus logistic and language support for screening may be particularly beneficial for never screened women.

Unlike most other programs targeting specific ethnocultural or marginalized groups,^{32–34,41,44,45} CARES participants were extremely diverse. The program's success suggests that its model is broadly applicable. The core components of collaboration with community agencies serving the target populations, linguistically tailored group education involving peer leaders with concrete support such as child care and transportation, and navigation and support to access screening can be adapted to meet the specific needs of individual underserved groups. However, they may be more or less effective for certain populations. The trend toward lower screening uptake by older women in CARES suggests that they may experience unique barriers or be inherently less motivated to be screened. Unfortunately, the study sample was too small to detect differences in screening among specific ethnocultural groups and did not differentiate between immigrant and refugee participants.

Limitations

This study has several limitations. First, although groups were well matched, important unmeasured variables may have differed. Women attending CARES sessions may have been inherently more motivated to be screened than controls (self-selection bias). Second, women with a previous history of breast or cervical cancer or hysterectomy, which would alter their screening requirements, were not excluded. Third, data were obtained for only one fifth of women who participated in the program. Not all women consented and many women who were otherwise willing to consent did not bring their OHIP numbers, which were needed for matching to administrative data. However, it is unlikely that there were systematic differences among women for whom data could and could not be obtained that would compromise validity. Fourth, the lack of CCO data on Pap tests processed through hospital laboratories underestimates Pap testing, which would in turn affect the determination of the outcome. However, the vast majority of screening Paps in primary care, such as those completed in the control group and CARES group pre-education, are processed through community laboratories. Eight post-education Paps performed in the hospital clinic for women in the CARES group were not included in the

analysis, which will therefore underestimate the program's effect. Finally, although CARES showed a strong effect, particularly among never screened women, it is not known whether women will continue with the recommended screening needed to realize preventive health benefits.

CONCLUSIONS

This multifaceted community-based intervention incorporating language-specific group education led by peer leaders, screening facilitation, and targeting diverse ethnocultural groups was successful in increasing Pap and mammography uptake among UNS women. Future interventions should build on these strategies and explore ongoing screening facilitation as a way to maintain screening over time.

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Sheila Dunn was responsible for the overall design of the research, participated in the analysis, interpretation of the data, wrote the first draft of the manuscript, and produced the final version. Aisha Lofters made a substantial contribution to the design of the research, the analysis and interpretation of the data, assisted in the writing and revision of the manuscript, and has read and approved the final version. Ophira Ginsburg made a substantial contribution to the conception and design of the study, critically revised the article, and has read and approved the final version. Christopher Meaney led the data analysis and interpretation, contributed to the writing of the manuscript, and has read and approved the final version. Farah Ahmad contributed to the conception and design of the study, the interpretation of the data, revised the manuscript for important content, and has read and approved the final version. Catherine Moravac made substantial contributions to the conception of the study and data acquisition. She revised the article for important content and has read and approved the final version. Janet Nguyen made substantive contributions to the data acquisition, revised the article for important intellectual content, and has read and approved the final version. Angela Arisz made substantive contributions to data acquisition, revised the manuscript for important intellectual content, and has read and approved the final version.

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SUPPLEMENTAL MATERIAL

Supplemental materials associated with this article can be found in the online version at <http://dx.doi.org/10.1016/j.amepre.2016.11.023>.

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