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Breast cancer survival of American Indian/Alaska Native women, 1973–1996

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Summary

Objective: To assess breast cancer mortality rates among American Indian/Alaska Native women compared with non-Hispanic White women in the five years after diagnosis.
Methods: Surveillance, Epidemiology, and End Results data from 1973–1996 were used to compare survival in the two races, controlling for age, marital status, stage, and therapy.
Results: The adjusted relative hazard of death was 58 % higher for American Indian/Alaska Native women than for non-Hispanic White women (HR = 1.58, 95 % CI 1.26–2.00). The survival disparity persisted even when limited to women who received definitive therapy, i. e. mastectomy with axillary node dissection or breast-conserving surgery with axillary node dissection and radiation treatment (HR = 1.88, 95 % CI 1.40–2.52).
Conclusions: American Indian/Alaska Native women were at greater risk for breast cancer mortality than non-Hispanic White women, even when restricted to women who received definitive breast cancer therapy.

Keywords: Survival analysis – Breast neoplasms – Breast cancer survival – American Indian – Alaska Native – Racial differences.

Current efforts to prolong breast cancer survival focus on the promotion of earlier detection and the optimization of treatment after diagnosis. Screening mammography has been shown to increase the length of survival among women with breast cancer through early identification of disease (Tabar et al. 2001; Humphrey et al. 2002; US Preventive Services Task Force 2002; Retsky et al. 2003). Non-Hispanic White women with biennial screening rates of 60 % to 80 % have disproportionately benefited from mammography compared to American Indian/Alaska Native women with lower biennial screening rates of 35 % to 65 % (Agency for Health Care Policy and Research 1991; Giuliano et al. 1998; Hahn et al. 1998; Blackman et al. 1999; Coughlin et al. 1999; Gilliland et al. 2000). American Indian women have poorer breast cancer five-year survival than women of other races, after controlling for stage at diagnosis and initial treatment (Frost et al. 1996). In addition, American Indians from New Mexico and Arizona are significantly less likely than non-Hispanic Whites to receive appropriate cancer therapy after diagnosis of cancer of the breast, cervix and rectum, or melanoma (Gilliland et al. 1998).

Using breast cancer data from the Surveillance, Epidemiology, and End Results (SEER) Program of the National Cancer Institute, we examined differences in five-year survival of American Indian/Alaska Native women compared with non-Hispanic White women 40 years and older after diagnosis of first invasive breast cancer, 1973–1996, in all 11 geographical sites of the SEER Program. Our study advances the work of Frost et. al. (1996), on breast cancer survival in New Mexico and Arizona, by extending analysis to all the sites of the SEER Program and by examining whether survival differences persisted when limited to women who received definitive therapy. Definitive therapy was defined as mastectomy with axillary node dissection or breast-conserving surgery with axillary node dissection and radiation treatment (NIH Consens Statement 1990). Our hypothesis was that a potential disparity in survival between these race/ethnic groups would disappear or be lessened when restricted to women receiving definitive therapy, after controlling for age at diagnosis, marital status, and extent of disease.

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Methods

Study population and design

The data used in this study were a sub-sample of the breast cancer database from the SEER Program data, 1973–1996. The SEER Program collects and publishes cancer incidence and survival data from 11 population-based cancer registries covering approximately 14% of the United States population (National Cancer Institute 1999). The SEER registries routinely collect data on patient demographics, primary tumor site, morphology, stage at diagnosis, first course of treatment and follow-up for vital status. The mortality data reported by SEER are provided by the National Center for Health Statistics (National Cancer Institute 1999). Accurate and complete information from the SEER public-use data was not available on chemotherapy, adjuvant hormonal therapy, follow-up treatment or treatment after recurrence of breast cancer.

This study included American Indian/Alaska Native and non-Hispanic White women 40 years and older with primary invasive breast cancer. In all, there were 224767 primary, first occurrence breast cancer records in the SEER breast cancer database on the public-use CD-ROM for 1973–1996. We excluded 2020 cases diagnosed from autopsy records or death certificates, 479 cases lost to follow-up and 27753 cases. Among the remaining 194515 cases, 511 American Indian/Alaska Native women were identified as such if their race was recorded as American Indian or Alaska Native regardless of their Hispanic origin. As a comparison group, we included non-Hispanic White women if their race was recorded as White and they were not of Hispanic origin. Each of the 511 American Indian/Alaska Native cases was matched with four non-Hispanic White women (n = 2044) from the same geographic location, diagnosed in the same month and year, using a stratified sampling design. The final number of women in the data file used for analysis was 2555. The sample size of 511 American Indian/Alaska Native women had sufficient power for this analysis, but was too small for stratification by individual sites of the SEER program.

Outcome measures

For each subject, we calculated the survival time, in years, as the time from diagnosis to death, or to the end of the study (December 31, 1996). The outcome of interest was breast cancer-specific mortality in the first five years after diagnosis, which was assigned to subjects whose underlying cause of death contained the International classification of disease, ninth revision code 174.0–174.9 for breast cancer.

Potential confounders

We examined age at diagnosis, marital status, stage of disease at diagnosis, lymph node involvement and tumor size at diagnosis, radiation treatment, and cancer-directed surgery as potential confounders. These variables have been shown to be associated with mortality after diagnosis of cancer of the breast and other sites (Frost et al. 1996; Kravdal 2001; Clegg et al. 2002; Singletary 2003; Legorreta et al. 2004). Age at diagnosis was categorized into five groups: 40–49 years, 50–64 years, 65–74 years, 75–84 years, and 85 years and older. Marital status was categorized as married and not married.

From 1973–96, the SEER data included a data item for every case representing the historical stage of disease at diagnosis using the categories localized, regional and distant. For cases reported from 1973–87, this stage was the only variable available for extent of disease. Beginning in 1988, SEER data included more detailed information on tumor size, lymph node involvement, metastasis (TNM), estrogen and progesterone receptor status, and the American Joint Committee on Cancer (AJCC) stage assigned to each case (American Joint Committee on Cancer 1992). We selected the TNM variables for extent of disease at diagnosis, as available, and analyzed three sets of variables: a) stage of disease categorized as local (tumor contained within the anatomic boundaries of the breast), regional (spread to tissues adjacent to the breast or lymph nodes that drain the breast), or distant (metastasis to non-adjacent tissues, organs or lymph nodes), b) tumor size, available on cases diagnosed in 1988 or later – categorized as tumor sizes less than or equal to 2 centimeters, 2.1 to 5 centimeters, greater than 5 centimeters, or tumors of any size with direct extension to chest wall or skin; and c) lymph node involvement available on cases diagnosed in 1988 or later – categorized as no regional lymph node metastasis, metastasis to movable ipsilateral axillary lymph nodes, metastasis to ipsilateral axillary lymph nodes that are fixed to one another or to other structures, metastasis to ipsilateral internal mammary lymph nodes, distant lymph node metastasis, and unknown node involvement (American Joint Committee on Cancer 1992).

We restricted sub-analyses to women who received definitive care to avoid residual confounding by unknown factors in the group of women without definitive care. Hence, to assess whether a disparity in survival persisted between American Indian/Alaska Native and non-Hispanic White women persisted receiving a high standard of initial treatment, we restricted sub-analyses to women who received definitive therapy in terms of radiation treatment and cancer-directed surgery. Radiation treatment was categorized dichotomously into having received radiation or not. We categorized cancer-directed surgery as a) no surgery performed; b) breast-conserving surgery with no axillary node dissection; c) breast-conserving surgery with axillary node dissection; d) mastectomy with no axillary node dissection; and e) mastectomy with axillary node dissection. The data items for surgery and radiation treatment were combined into a category that represented definitive therapy. We categorized women as having received definitive therapy according to the guidelines of the 1990 National Institutes of Health Consensus Development Conference on Early Stage Breast Cancer (NIH Consensus Statement 1990). Definitive therapy was defined as 1) mastectomy with axillary node dissection or 2) breast-conserving surgery with axillary node dissection and radiation treatment.

Analytic method

We investigated the relationship between the main effect of race/ethnicity with each of the potential confounders by comparing the frequency distributions by race/ethnicity using chi-square tests. We also examined the unadjusted mortality rates stratified by levels of the potential confounders. Crude analyses, bivariate, and multivariate analyses used Cox proportional hazards regression to assess the effect of race/ethnicity, with each potential confounder separately and simultaneously, on the outcome of death due to breast cancer in the first five years after diagnosis (Allison 1995). The list of confounders examined included: age at diagnosis, marital status, historical stage of disease at diagnosis, tumor size, metastasis and lymph node involvement, and definitive or less than definitive treatment modality. Variables were retained in the models if they were found to be confounders of the relationship between race/ethnicity and survival or if the variables had been shown by previous studies to be associated with breast cancer mortality (Frost et al. 1996; Kravdal 2001; Clegg et al. 2002; Singletary 2003; Legorreta et al. 2004). Additional multivariable analyses examined the effect of race/ethnicity to see if any disparity persisted when restricted to women who received definitive therapy.

Results

Study population characteristics

Breast cancer cases from New Mexico and Arizona represented 50.7% of all the cases in this study, while 28.6% were reported from the Seattle-Puget Sound SEER registry. The large number of American Indian/Alaska Native women in the New Mexico and Arizona SEER registry and the Seattle-Puget Sound SEER registry was not surprising. Areas with high densities of American Indian/Alaska Native peoples were targeted as race/ethnic-specific sites for data collection (National Cancer Institute 1999): Seattle-Puget Sound area has a large urban American Indian/Alaska Native population, and New Mexico and Arizona have a large reservation/rural population (Department of Commerce, Bureau of the Census 1992).

Table 1 contains the distribution of demographic, stage and treatment variables by race/ethnic group. American Indian/Alaska Native women were younger at diagnosis than the non-Hispanic White women. Women aged 40–64 years at diagnosis represented 70.1% of all the American Indian/Alaska Native women and 54.0% of the non-Hispanic White women. Regional and distant stage at diagnosis occurred in larger percentages of American Indian/Alaska Native women compared to non-Hispanic White women.

Analysis of survival

Death within the first five years following diagnosis: The unadjusted hazard of breast cancer-specific mortality in the first five years following diagnosis was 88% higher for American Indian/Alaska Native women than for non-Hispanic White women (unadjusted hazard ratio 1.88, 95%CI 1.51–2.34). Table 2 shows that, after controlling for age at diagnosis, marital status, historical stage of disease at diagnosis, tumor size (results not shown in table), metastasis and lymph node involvement (results not shown in table), and treatment modality, the adjusted hazard ratio of breast cancer-specific mortality remains 58% higher for American Indian/Alaska Native women than non-Hispanic White women (adjusted hazard ratio 1.58, 95% CI 1.26–2.00). This relatively small reduction in hazard is primarily due to controlling for treatment (surgery details), which was responsible for reducing the adjusted hazard ratio to 1.67 in bivariate models. The hazard of breast cancer death in the first five years following diagnosis was also associated with marital status, stage of disease at diagnosis, and cancer-directed surgery. In these analyses, age at diagnosis was not associated with the hazard of breast cancer death in the first five years following diagnosis. Furthermore, sub-analyses of women from the two sites with large American Indian and Alaska Native populations, New Mexico and Seattle, found similar effects of race on the hazard of death due to breast cancer in the first five years after diagnosis (data not shown). Additional analyses found similar effects of race on the hazard of death due to all causes as the outcome (data not shown). We have also not shown the effects of tumor size, node involvement and metastasis variables in the tables presented here because the main focus of this study was to investigate the disparity in survival between American Indian/Alaska Native and non-Hispanic White women. The

Table 1 Distribution of demographics, stage and treatment by race/ethnic group. American Indian/Alaska Native and Non-Hispanic women with breast cancer, SEER sample 1973–96

Characteristic	American Indian/ Alaska Native N = 511 (%)	Non-Hispanic White N = 2044 (%)
Age at Diagnosis, years (p <0.0001)[a]		
40–49	144 (28.2 %)	356 (17.4 %)
50–64	214 (41.9 %)	746 (36.5 %)
65–74	87 (17.0 %)	520 (25.4 %)
75–84	57 (11.2 %)	323 (15.8 %)
85+	9 (1.8 %)	99 (4.9 %)
Marital status (p = 0.001)[a]		
married	262 (51.3 %)	1 201 (58.8 %)
unmarried	226 (44.2 %)	795 (38.9 %)
unknown	23 (4.5 %)	48 (2.4 %)
Stage at diagnosis (p = 0.0008)[a]		
local		
local (diagnosed <1988)	93 (18.2 %)	499 (24.4 %)
stage I	108 (21.1 %)	519 (25.4 %)
stage IIA	26 (5.1 %)	134 (6.6 %)
stage IIB	4 (0.8)	8 (0.4 %)
regional		
regional (diagnosed <1988)	101 (19.8 %)	338 (15.6 %)
stage IIA	39 (7.6 %)	136 (6.7 %)
stage IIB	45 (8.8 %)	138 (6.8 %)
stage IIIA	18 (3.5 %)	40 (2.0 %)
stage IIIB	9 (1.8 %)	29 (1.4 %)
distant		
distant (diagnosed <1988)	26 (5.1 %)	76 (3.7 %)
stage IV	24 (4.7 %)	53 (2.6 %)
unstaged	18 (3.5 %)	74 (3.6 %)
Level of initial therapy received (p = 0.23)[a]		
less than definitive therapy	105 (20.6 %)	373 (18.2 %)
definitive therapy	406 (79.4 %)	1 671 (81.8 %)

[a] p-values obtained from chi-square test.

Table 2 Breast cancer mortality: first five year survival multivariable model, American Indian/Alaska Native and Non-Hispanic women with breast cancer, SEER sample, 1973–96

Variable	Relative hazard	95 % Confidence Interval
Race/ethnic group		
non-Hispanic White	1.00 (Referent)	
American Indian/Alaska Native	1.58	1.26–2.00
Age at diagnosis, years		
40–49	1.00 (Referent)	
50–64	0.99	0.75, 1.31
65–74	0.80	0.58, 1.12
75–84	0.97	0.67, 1.41
85+	1.15	0.67, 1.97
Marital status		
married	1.00 (Referent)	
unmarried	1.31	1.05, 1.64
Stage at diagnosis		
local	1.00 (Referent)	
regional	2.61	1.20, 5.64
distant	10.27	4.88, 21.62
unstaged	5.13	2.20, 11.99
Level of initial therapy received		
less than definitive therapy	1.00 (Referent)	
definitive therapy	0.379	0.29, 0.50

Variables in multivariable Cox proportional hazards regression model: Race, age at diagnosis, marital status, historical stage of disease at diagnosis, tumor size (results not shown in table), metastasis and lymph node involvement (results not shown in table), level of initial therapy received.

parameters and coefficients for every term in these analyses are available from the authors upon request.

Definitive therapy: We investigated whether or not the disparity in survival persisted among women who received definitive therapy. Four hundred six (79.4%) American Indian/Alaska Native women received definitive therapy compared to 1671 (81.8%) of non-Hispanic White women (p-value from chi-square test = 0.23). The adjusted breast cancer mortality relative hazard for American Indian/Alaska Native women who received definitive therapy compared with non-Hispanic White women who received definitive therapy was 1.88 (95% CI 1.40–2.52), controlling for age at diagnosis, marital status, historical stage of disease at diagnosis, tumor size, metastasis and lymph node involvement.

Discussion

In this study, American Indian/Alaska Native women had a greater adjusted hazard of breast cancer-specific mortality in the first five years following diagnosis of breast cancer than non-Hispanic White women. This difference in breast cancer survival persisted among women who received definitive breast cancer therapy, suggesting that quality of care, as measured by receipt of definitive primary tumor therapy, does not explain the poorer survival among American Indian/Alaska Native women.

The persistent disparity in the distribution of breast cancer and breast cancer survival between American Indian/Alaska Native women and non-Hispanic White women may be due to biologic factors, access to culturally appropriate health care, timeliness of breast cancer treatment, the proximity to health care facilities, or access to specialty providers – such as oncologists. Our findings of persistent racial and ethnic disparity in survival after diagnosis of breast cancer are consistent with results of other studies in which American Indian/Alaska Native women (Clegg et al. 2002) and African American women (Wojcik et al. 1998; Clegg et al. 2002) had poorer breast cancer survival rates than non-Hispanic White women.

Patterns of health care seeking and access to health care may play a large role in the quality of breast cancer care received by American Indian/Alaska Native women. Barriers such as geographical distance from health care providers, limitations placed on specialist choices, lack of culturally sensitive health care providers and educational materials, differences in the quality of health care, and medical treatment regimens that focus on the symptoms of illness rather than healing the whole body, can contribute to under-utilization of available health care (Lillie-Blanton & Hoffman 2000; Rhoades 2000; van Ryn & Burke 2000). Socio-economic stressors such as low relative income, few employment opportunities, and residence in medically-underserved areas may supersede medical concerns, further adding to the psychological impact of a breast cancer diagnosis (Cooper 1984; Gotay 1985; Singletary 2003).

In this study, the association between advanced stage of disease and increasing tumor size and lymph node involvement on survival in the first five years after diagnosis of breast cancer were similar to those observed in other studies (Li et al. 2003; Montella et al. 2003; Legorreta et al. 2004). The small numbers of distant tumors among both racial groups in this study resulted in a somewhat unstable hazard ratio reflected by wide confidence intervals for this term in our Cox proportional hazards models.

The percentage of breast cancer cases among American Indian/Alaska Native women in the age groups 40–49 years and 50–64 years was higher than that in corresponding age groups among non-Hispanic White women (40–49 years: 28.2% vs. 17.4% and 50–64 years: 41.9% vs. 36.5%). Some of this disparity can be explained by the differences in population distributions between the two race/ethnicity groups. In the 1990 US Census, among women 40 years and older, for American Indian/Alaska Native women, 40.9 % were 40–49 years of age compared to 15.9% of White women. However, the 1990 population percentages for women 50–64 years of age were 35.5% for American Indian/Alaska Native women and 39.0 % for White women (among women 40 years and older)(Department of Commerce, Bureau of the Census 1992).

Measurements of the socio-economic status of participants would have allowed exploration of the practical stressors experienced by American Indian/Alaska Native women versus non-Hispanic white women, as well as the associated resources available to address these stressors. Ideally, we would also have included other important predictors of breast cancer such as obesity and family history of breast cancer. However, the public-use SEER data does not include information on socio-economic class, height, weight, family history of breast cancer, type of health insurance, co-existing medical conditions, or the dates of cancer-directed surgery, radiation treatments, or any specific information on chemotherapy treatments or other treatments. Race/ethnicity, age and marital status were the only demographic data items available to use in our analysis. Our finding that unmarried women had poorer survival after diagnosis of breast cancer than married women is consistent with the theory that people who are married have financial and emotional resources that unmarried people do not have. Other researchers have reported similar findings (Kravdal 2001; Lund et al. 2002; Tower et al. 2002). While some of the racial disparity observed in our study may be attributed to unmeasured differences in social class, unmeasured biological differences cannot be discarded as explanations for the poorer survival observed among American Indian/Alaska Native women.

Studies based on surveys of clinic- and hospital-based cancer registries are susceptible to misclassification of race and ethnicity (Frost et al. 1992). Clerks completing forms for the cancer registry usually assign a patient's race/ethnicity. The extent of racial misclassification is likely to be higher in locations with fewer American Indians and Alaska Natives. In the Seattle/Puget Sound SEER cancer registry, 60% of the American Indian/Alaska Native patients with invasive cancer who were also registered with the Indian Health Service were misidentified (Frost et al. 1992). We considered the potential for information bias in our study. The magnitude of any potential overestimation or underestimation of effect would depend, in part, on the number of women excluded from this study due to misidentification of their race/ethnicity. We compared the effect of race/ethnicity on outcome in the subgroups of women identified by the Seattle/Puget Sound and the New Mexico/Arizona SEER cancer registries and observed similar effects, suggesting that information bias is not playing an important role in our data.

In addition to errors in assigning the correct race/ethnicity, there may also be errors in the cause of death reported on death certificates (Engel et al. 1980). Studies have reported errors in assigning causes of death on death certificates, but such errors occur less often when the cause of death is malignant neoplasm (Kircher et al. 1985). Breast cancer is coded in error less often than other types of cancer (Gobbato et al. 1982; Mollo et al. 1986). We found no reports of differences in assigning breast cancer as the cause of death to American Indian/Alaska Native women compared with non-Hispanic White women. A low rate of non-differential misclassification of the cause of death would exert a negligible bias toward the null in our study.

The data in this study did not include information on co-existing medical conditions that may have been involved in treatment decisions or conditions that may have affected a woman's chances of survival after diagnosis. Information on the cause of death, however, was examined for differences that may have contributed to the disparity in survival between the race/ethnicity groups. We found a lower proportion of cardiovascular disease deaths among American Indian/Alaska Native women than non-Hispanic white women, which may reflect the difference in age distributions (data not shown). We also found a slightly higher proportion of deaths from diabetes mellitus, which is not surprising because of the higher prevalence of this disease in American Indian/Alaska Native people (Indian Health Service 1998). Complications from co-existing medical conditions, such as diabetes mellitus, may have contributed to the disparity in survival after diagnosis of breast cancer because diabetes-associated endocrine factors may influence the growth of some breast tumors (Bruning et al. 1992; Sellers et al. 1998).

Conclusions

In this study we found that, in the first five years after diagnosis of breast cancer, American Indian/Alaska Native women had a breast cancer mortality adjusted relative hazard of 1.58 (95% CI 1.26–2.00) compared to non-Hispanic White women, controlling for age, marital status, stage of disease at diagnosis, treatment modality. The results of this study have extended the work of Frost et. al. (1996) by examining whether the difference in survival persists among women who received definitive therapy. We found that the disparity in breast cancer survival was evident even among women who received definitive breast cancer therapy, suggesting the potential importance of biology and other indicators of cancer care quality, such as delays in treatment, the presence of clean surgical margins, and surveillance for recurrence.

The relatively poor survival of American Indian/Alaska Native women compared to non-Hispanic White women in our study warrants further investigation. We recommend further investigation into the interval between the time of diagnosis and initiation of treatment, quality of treatment, quality of follow-up care, information on adjuvant chemo- or hormonal therapy, assessment of co-existing medical conditions, treatment after recurrence of breast cancer, and improved measures of socio-economic status to shed more light on the survival differences between American Indian/Alaska Native women and non-Hispanic White women. Native communities are diverse in terms of risk factors among the community members, as well as in terms of availability of health care services. Studies are needed to investigate potential biological differences in breast tumors and additional prognostic factors leading to improved cancer control strategies to reduce the continuing disparities in breast cancer survival experienced by American Indian/Alaska Native communities.

Zusammenfassung

Überlebensraten nach Brustkrebs bei amerikanischen Frauen indianischen Ursprungs und aus Alaska, 1973–1996

Fragestellung: Vergleichen der Brustkrebsmortalitätsraten von amerikanischen Frauen indianischen Ursprungs und aus Alaska mit weissen, nicht-lateinamerikanischen Frauen fünf Jahre nach der Diagnose.

Methode: Die Surveillance-, epidemiologischen und die Endergebnisse der zwischen 1973 und 1996 erhobenen Daten wurden gebraucht, um das Überleben zwischen den zwei ethnischen Gruppen zu vergleichen, die Daten wurden für Alter, Zivilstand, Entwicklungsstand und Therapie des Krebses kontrolliert

Ergebnisse: Das angepasste relative Risiko war 58 % höher für amerikanischen Frauen indianischen Ursprungs und aus Alaska als für weisse, nicht-lateinamerikanische Frauen (OR = 1,58; 95 %-KI 1,26–2,00). Dieser Unterschied bleibt auch dann noch bestehen, wenn nur noch für Frauen mit chirurgischer Therapie, d. h. Brustamputation und Entnahme der Lymphknoten der Achselhöhle oder brusterhaltende Operation mit Entnahme der Lymphknoten der Achselhöhle und Strahlentherapie, gerechnet wurde (OR =1,95 %-KI 1,40–2,52).

Schlussfolgerung: Amerikanische Frauen indianischen Ursprungs und aus Alaska haben ein grösseres Risiko für Brustkrebsmortalität als weisse, nicht-lateinamerikanische Frauen, sogar wenn der Vergleich nur für Frauen mit einer chirurgischen Therapie gemacht wurde.

Résumé

Survie post cancer du sein chez les femmes américaines d'origine indienne ou d'Alaska, 1973–1996

Objectifs: Comparer les taux de mortalité par cancer du sein cinq ans après le diagnostic chez les femmes américaines d'origine indienne ou d'Alaska et chez les femmes blanches non-hispaniques.

Méthodes: Les résultats (surveillance, épidémiologie et issues) enregistrés entre 1973 et 1996 ont été utilisés pour comparer la survie entre les deux groupes ethniques ; ils ont été contrôlés pour l'âge, l'état civil, le stade de développement du cancer et le traitement.

Résultats: Le risque relatif ajusté était de 58 % supérieur pour les femmes américaines d'origine indienne ou d'Alaska comparé aux femmes blanches non-hispaniques (OR = 1.58, 95 % CI 1.26–2.00). La différence de survie restait présente lorsque la comparaison se limitait aux femmes ayant subi des traitements, c'est-à-dire soit une mastectomie avec ablation des nodules axillaires, soit une chirurgie conservatrice du sein avec radiothérapie (OR =1.88, 95 % CI 1.40–2.52).

Conclusions: Les femmes américaines d'origine indienne ou d'Alaska avaient un plus grand risque de mourir d'un cancer du sein que les femmes blanches non-hispaniques, même lorsque la comparaison était limitée aux femmes ayant bénéficié d'un traitement définitif du cancer de sein.

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