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FINALLY, MARRIAGE PAYS OFF MARITAL STATUS AND BREAST CANCER SURVIVAL

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The American Cancer Society's (2006) estimate for new breast cancer cases in the United States in 2006 is 214,640. Of these, 1,720 are estimated to be male and 212,920 are estimated to be female. The estimate for deaths caused by breast cancer is 41,430. Four hundred and sixty of those deaths are estimated to be male and 40,970 are estimated to be female. The estimate of new breast cancer cases in Minnesota is 3,070. Two hundred and fifty deaths are estimated. From birth to age 39, one woman in 231 will get breast cancer. From ages 40 to 59, one in 25 women will get breast cancer. From ages 60 to 79, one in 15 women will get breast cancer (Breastcancer.org, 2006). Breast cancer is the second highest cause of death for women with cancer after lung cancer. It is responsible for 15% of all deaths from cancer. Breast cancer is the leading site for new breast cancer cases at 31% of all new cancer cases. Since 20% of all breast cancer cases are thought to be preventable, researchers are studying lifestyle choices and patterns - including marital status - for their influence on outcomes. The purpose of this study was to examine outcomes post-breast cancer treatment for single women versus married women.

BACKGROUND OF BREAST CANCER BIOLOGY, DIAGNOSIS, AND TREATMENT

The breast is made up of lobes and ducts. A breast has 15-20 lobes. Lobes have smaller sections called lobules, which end in dozens of small bulbs that produce milk. These lobes, lobules, and bulbs are connected by ducts. Each breast has blood vessels and lymph vessels. Lymph vessels carry lymph, an almost colorless fluid. Lymph vessels lead to organs called lymph nodes, or glands. Lymph nodes filter substances in lymph and fight infection and disease. Clusters of lymph nodes are in the underarm, above the collarbone, and in the chest (National Cancer Institute, 10/04/06).

Healthy cells divide and reproduce in an orderly way and the body relies on that process to repair injuries and replace tissue. But when cells grow out of control, they make extra tissue, which are tumors. Breast cancer happens when abnormal cells develop in the breast and cluster to form tumors. The tumors can be benign--not cancerous--or malignant--cancerous. Breast cancer will start with one abnormal cell and can develop slowly or quickly. It can sometimes take years to develop a noticeable tumor.

Malignant (cancerous) tumors are made up of abnormal cancerous cells. These cells can break away and travel through the bloodstream to other parts of the body, which can spread the cancer throughout the body. Cancer can spread to lymph nodes, lungs, liver, bones, and other parts through blood vessels. This is called metastasis, and if it happens, the cancer is more difficult to treat (American Cancer Society, 2002). Breast cancer is usually located in the upper, outer part of the breast but can occur anywhere (American Cancer Society, 2002). The most common type of breast cancer is called duc-

tal carcinoma, and begins in the cells of the ducts. Cancer that begins in lobes or lobules is called lobular carcinoma. Another type of breast cancer is inflammatory breast cancer, when the breast is red and swollen, but it is very uncommon (National Cancer Institute, 10/04/06).

Scientists use stages to describe in simple terms the extent of cancer. Stages go from Stage 0, which is non-invasive (cancer that does not travel), to Stage IV, which is cancer that has spread to other parts of the body. There are six different stages, including stages 3A and 3B. Stages 0, 1, and 2 are early types of cancer. Stages 2, 3A, and 3B are later, more serious types of breast cancer. Stage 4 is very advanced cancer.

Stage 0- Non- invasive cancer, meaning it has not spread to anywhere else in the body from the place where it originated. There is no evidence that any cancerous cells have broken off of the tumor.

Stage 1- Invasive cancer, meaning it has invaded other tissue besides where it originated. The tumor measures up to two centimeters, and there are no lymph nodes detected with cancer cells present.

Stage 2- Invasive cancer with the tumor measuring at least two centimeters but not more than five centimeters. Another type of stage 2 cancer is when the cancer has spread to underarm lymph nodes on the same side as the breast cancer. The affected lymph nodes don't stick to each other or the surrounding tissue. The tumor can be any size.

Stage 3A- Invasive cancer with a tumor that is larger than five centimeters. Another type of stage 3A cancer is when lymph nodes are cancerous and they stick to each other or the surrounding tissue.

Stage 3B- Invasive cancer with a tumor of any size. The cancer has spread to the breast skin, the chest wall, or lymph nodes located beneath the breast, under the ribs, or inside the middle of the chest (internal mammary lymph nodes). A type of breast cancer that is counted as stage 3B is inflammatory breast cancer, which is very rare. When the breast has inflammatory breast cancer, it is red and puffy with ridges, welts, and hives. A lump may be present only half the time.

Stage 4- Invasive cancer where the tumor has spread past the breast, the underarm lymph nodes, and the internal mammary lymph nodes. Tumors may have spread to lymph nodes that are located at the base of the neck above the collarbone (supraclavicular lymph nodes). It may also have spread to the lungs, liver, bones, or brain. The cancer may be metastatic, meaning that the cancer had already spread to beyond the breast and the nearby lymph nodes when the cancer was first found (Breastcancer.org, 10/4/06).

Treatment for breast cancer includes lumpectomy, mastectomy, radiation, chemotherapy, and hormone therapy. Type of treatment usually depends on the stage of the breast cancer and the personal choices of the person with breast cancer. There are also different kinds of therapy to make sure the cancer doesn't recur.

Lumpectomy and mastectomy are surgical choices. In a lumpectomy the breast cancer and some normal surrounding tissue is removed. Sometimes axillary lymph nodes are removed as well.

Mastectomy may be categorized in four groups: partial or segmental mastectomy, total or simple mastectomy, modified radical mastectomy, and radical mastectomy.

The axilla, or armpit, contains lymph nodes, and the underarm glands are removed. A total or simple mastectomy is when the entire breast and some glands are removed. A modified radical mastectomy is when the breast, most of the glands, the lining over the chest muscles, and, sometimes, part of the chest wall muscles, are removed. A radical mastectomy is when the breast, the chest muscles, and most of the glands are removed, but this is rarely used today.

Three kinds of adjuvant therapy are currently standard care for breast cancer treatment. These therapies include radiation therapy, chemotherapy, and hormone therapy. These are used to kill any cancer cells that may be left in the body after surgery and to help prevent the cancer from recurring.

Radiation therapy uses high-energy x-rays to destroy cancer in the breast, chest, or axillary lymph nodes. It's mostly used after lumpectomy but can be used after mastectomy too. (Susan G. Komen Breast Cancer Foundation, 1999)

Chemotherapy is treatment with anticancer drugs. It can be given through a vein or by the mouth. The drug travels through the bloodstream and kills any cancer cells in the body (American Cancer Society, 2002).

Hormone therapy uses medication or surgical removal of the ovaries to prevent the body's hormones from stimulating the growth of any cancer cells that may remain after surgery (Susan G. Komen Breast Cancer Foundation, 1999).

RISK AND PROTECTIVE FACTORS

There are many factors that contribute to breast cancer, some of which can be controlled and some that are unchangeable. Anything that increases the risk of breast cancer is called a risk factor, and anything that reduces it is called a protective factor. If a woman has several risk factors, it does not mean she will get cancer, but it may mean she has an increased risk for it.

RISK FACTORS

The main risk factors are a personal or family history of breast cancer, prolonged exposure to estrogen, smoking, gender, race, and age (American Cancer Society, 9/20/06; Breastcancer.org, 2006) A woman with one cancerous breast will have increased risk of new cancer in the other breast or new cancer in the same breast. Having a mother, sister, or daughter with breast cancer almost doubles a woman's risk of cancer. Estrogen is a hormone that may encourage cells to divide, which increases the chance of the cells becoming cancerous, according to Graham (2006, pp. 96-100). Things that prolong exposure to estrogen are starting menstruation early (before age 12), going through menopause at a late age (after age 55), taking menopause hormone therapy, never having a full-term pregnancy, becoming pregnant for the first time after age 30, being overweight (which increases production of estrogen outside of the ovaries and adds to the overall level of estrogen in the body), exposure to estrogen in the environment, and having more than two alcoholic drinks a week.

Smoking may lead to increased risk because it exposes breast tissue to carcinogens (cancer-causing substances). The incidence of breast cancer is 30% higher in smokers

than people who have never smoked or quit 10 years or more ago. Being overweight is also a risk, especially if the weight was gained during adulthood or after menopause (American Cancer Society, 9/20/06). Women who gained 20-30 pounds in the 32-56 years after high school graduation are 40% more likely to get breast cancer than women who stayed within five pounds of their high school weight. Excess fat may raise circulating estrogen levels, which is dangerous for premenopausal women with naturally high levels of estrogen. Women who lose 20 pounds and keep it off may cut their risk by 57% (Graham, 2006, pp.96-100).

The largest risk for breast cancer is for women who are aged about 50-60. Nearly eight out of 10 cases of breast cancer are found in women over 50. A smaller contributor is the five to 10 percent of cancer cases that are linked to changes in genes, mostly the BRAC1 and BRAC2 genes. Women with those gene changes have up to an 80% chance of breast cancer (American Cancer Society, 9/20/06). Normally those genes prevent cancer cells from growing abnormally, but when they mutate they can raise breast cancer risk 180% over a lifetime (Graham, 2006, pp. 96-100). Alcohol and ethnicity also contributed to risk. White women are more likely to get cancer than African-American women, but African-American women are more likely to die of it. Research suggests this is because they have faster growing tumors. Asian, Hispanic, and Indian women are less likely to get cancer. Two to five alcoholic drinks a day increase the risk about 1.5 times (American Cancer Society, 9/20/06). Other resources say that drinking more than one drink a day will increase your risk by 20-50%. Alcohol may deter the liver's ability to get rid of potential cancer-causing substances in the body.

PROTECTIVE FACTORS

One study showed that walking as little as one hour and 15 minutes to 2 1/2 hours per day reduced risk by 18%. Living actively can cut risk by 40%. If you begin exercising regularly at any point in your life you can cut the cancer risk by 20% within 10 years. Exercise strengthens your immune system, which boosts your ability to stop precancerous breast cells from becoming cancerous or multiplying. Breast-feeding seems to reduce risk, especially if it lasts 1 1/2 - 2 years, possibly because it lowers the number of menstrual periods (American Cancer Society, 2006).

PREVENTION OF BREAST CANCER

Seventy-three percent of women think there is not much to do about the risk of breast cancer, but experts say that one of five breast cancer cases is preventable if more women take more proactive measures. There are many different ways a woman can prevent breast cancer, or can prevent death from breast cancer, including having mammograms, exercising more, or eating better.

Getting a breast exam is recommended for all women at least every three years until you turn 40. After 40 it is recommended to have one once a year. It is better to find cancer early, because the survival rate is higher. A Harvard Medical School study says that a careful breast exam should take about three minutes per breast, but on average physicians only take about 1.8 minutes for both breasts.

Some advocate breast self-examinations, but not everyone agrees. Some studies found that self-examinations did not actually save lives, and some found that they resulted in unnecessary biopsies, which may be expensive (Graham, 2006, pp. 96-100). One study found that in women who did monthly self-examinations, the number of biopsies done was much higher than in women who did not, 2761, compared with 1505 (Thomas, 2002, pp. 1445-1457). The Young Survival Coalition says that 80% of women under 40 find their own lumps.

Mammograms are probably the most important thing to do to prevent breast cancer, but one in three women do not have a yearly mammogram (Graham, 2006, pp. 96-100). It is also good to limit alcohol consumption, have a good diet, and exercise regularly.

MARRIAGE AND CANCER

There are many studies about the connection between marital status and cancer, with mixed results. Langenbach (2003) argued that married people are more likely to have a follow-up more quickly after having symptoms than unmarried people. Osborn (2005) says that unmarried women are less likely to undergo therapy to assure that the cancer is completely gone than married people.

MARRIAGE: TREATMENT.

It is theorized that married women make better treatment choices for breast cancer, meaning that they undergo surgery and therapy to make sure all cancer is gone. Some studies have found that this is true, and some have found that marriage has nothing to do with it. Osborn (2005) found that unmarried women who were diagnosed at earlier, less serious stages of breast cancer were less likely to receive therapy. Unmarried women were more likely to not have chemotherapy. Unmarried women were more likely to decline therapy after they were diagnosed because of concerns over who would help them with transportation and care. Older unmarried women were more concerned about out-of-pocket expenses, which may lead to less treatment. Support from one's spouse leads to a greater likelihood of breast cancer screening and therapy. Donovan (2002) found that treatment choices by people with ovarian cancer was not related to marriage, age, number of children, or employment status. Chang (2005) found that unmarried patients were less likely to undergo surgical resection (complete removal of the cancer) and less likely to receive post-surgery radiation therapy. They were also more likely to refuse surgical resection and radiation. They also found that unmarried patients who did undergo surgical resection and post-surgery radiation had shorter survival rates than similarly treated married patients.

MARRIAGE: DIAGNOSIS.

It is theorized that married women are more likely to be diagnosed at earlier stages of the cancer than unmarried women and that there will be a shorter period of time between symptoms and when the doctor is consulted. Osborn (2005) found that unmarried women were more likely to be diagnosed at more advanced stages than married women, and unmarried women had larger tumors at the time of diagnosis. Langenbach

(2003) studied the delay in treatment time for people with colorectal cancer. The average interval of time between symptoms and the time the person went to the doctor was 243 days for divorced people and 220 days for single people. For widowed people, it was 216 days, and for married people, it was 119 days. The average number of days that passed after being diagnosed and then being admitted to the hospital was lowest among divorced people and second lowest among married people. Another study found that tumors were slightly larger in unmarried patients when they were diagnosed.

MARRIAGE: RISK.

Studies have found that unmarried men and women can be at a higher risk for different types of cancer. In 1842, it had already been noted that breast cancer was more common in unmarried women (Rigoni-Stern, 1842). Osborn (2005) found that unmarried women were at an increased risk of death from breast cancer. Older married women were at a decreased risk of mortality after diagnosis. Married people with cancer have a 15% reduced risk of mortality. Fraumeni (1969) found that Catholic nuns had higher rates of breast cancer, ovarian cancer, endometrial cancer, and colorectal cancer and lower rates of cervical cancer. A series of studies by Randi (2004) on Norwegian women showed that unmarried women had a higher risk of cervix, endometrium, ovary, brain, hematological malignancies, and thyroid cancers, but there was no association with lung cancer, breast cancer, colorectal cancer, or melanoma. It also showed that divorced women had a reduced risk of thyroid cancer, endometrial cancer, colorectal cancer, breast cancer, melanoma, and hematologic malignancies, and a higher risk of cervical and lung cancer. They found that never married, separated, and divorced men had a lower risk of prostatic cancer. However, there was no association found for widowed men compared to married men. The study found that marital status was not really linked to a risk of cancer.

MARRIAGE: GENERAL HEALTH.

Osborn (2005) found that married people have better overall health. Unmarried women who are healthy and financially independent may be more socially isolated and have increased mortality. The support of a partner leads to support of breast cancer screening, mammograms, and therapy. Social support leads to improved outcomes. However, one reason for this may be that when choosing a partner, people prefer healthy partners, and so health may precede marriage and not be related directly to the experience of being married (Kravdal, 2001). Further, in a study of symptom distress in women after breast cancer surgery, it was found that married subjects had a significantly higher symptom distress level and more frequency of nausea and pain. This was possibly because sympathy from others legitimizes the experience of distress and leads to an increased expression of distress (Kenefick, 2006). The study also suggested that the presence or absence of someone else affects appraisal of life events.

However, a study from the Fox Chase Cancer Center (Fox Chase Cancer Center, 10/3/06) found that marital status had nothing to do with survival rates of breast cancer, and this is the study cited on most breast cancer information Web sites.

Magnusson: Finally, Marriage Pays Off: Marital Status and Breast Cancer Survival National Cancer Institute data. Also, the contribution of ethnicity to survival for married and single people is examined.

METHODS

PARTICIPANTS

Data came from the SEERS database of the National Cancer Institute, which includes cancer data of all types from Connecticut, New Mexico, Utah, Hawaii, Georgia, Arizona, California, Michigan, Washington, Louisiana, and New Jersey and Puerto Rico – about 26 percent of the U.S. population – and the sample is representative of the population of the entire U.S. The data is for all cancer cases between 1973 and 2003. There are 387,123 breast cancer cases in the database, and all were included in this analysis.

STUDY VARIABLES

The variables of interest were age at diagnosis, race, survival time, and marital status. The figures below have information about the subjects in the data.

Age at Diagnosis. *Figure 1 shows the distribution. The majority of the subjects were between the ages of 40-70.*

AgeatDiagnosis

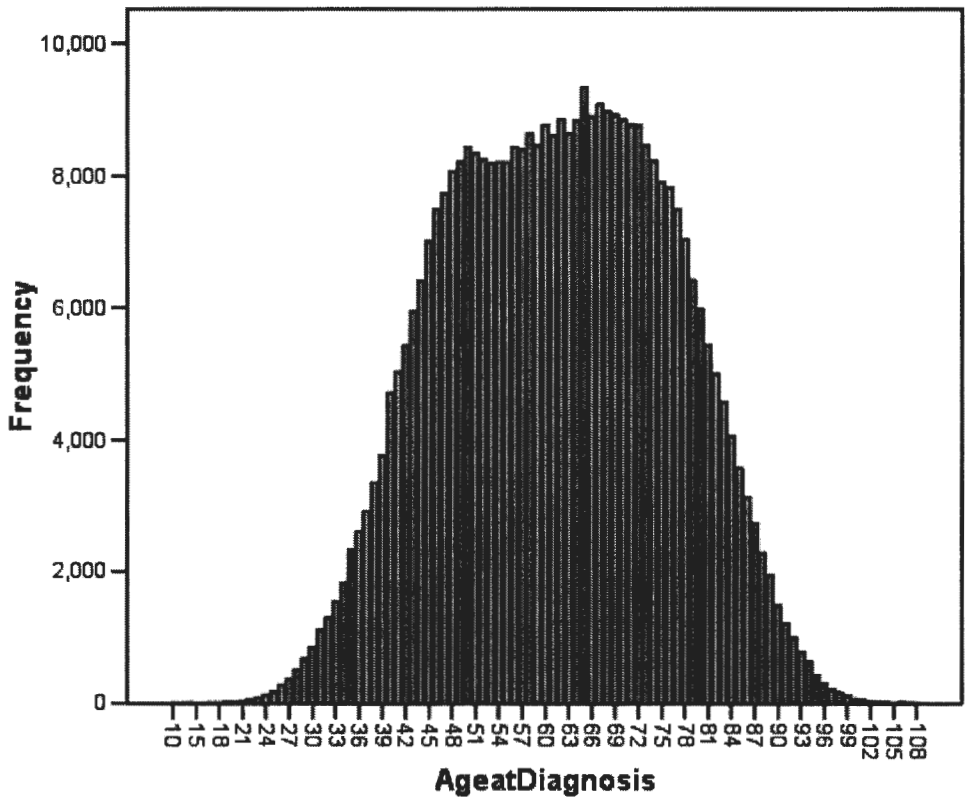


FIGURE 1

Ethnicity. Table 1 shows the ethnicity of the subjects. It is coded into numbers, so 1=White, 2=Black, 3=American Indian and Alaska Native. Seven and nine are those who ethnicity is unknown.

TABLE 1
ETHNICITY

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid -68	2	.0	.0	.0
1	335842	86.8	86.8	86.8
2	31692	8.2	8.2	94.9
3	18371	4.7	4.7	99.7
7	154	.0	.0	99.7
9	1064	.3	.3	100.0
Total	387125	100.0	100.0	

Magnuson. Finally, Marriage Pays Off: Marital Status and Breast Cancer Survival were diagnosed. It is coded in the data set as 1=Single (Never Married), 2=Married, 3=Separated, 4=Divorced, 5=Widowed, 9=Unknown. For my procedure, I recoded these into two categories: Single and Married.

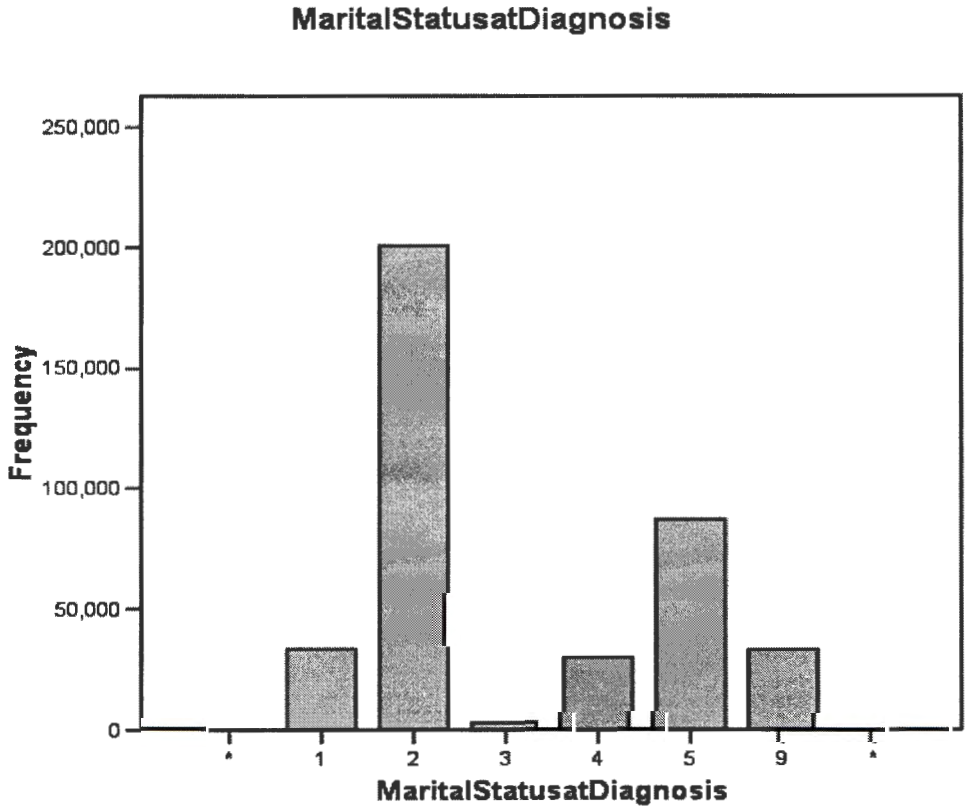


FIGURE 2

PROCEDURE

The hypothesis is that married women are more likely to survive breast cancer, and I was also interested in whether this result varied by ethnicity. To test the hypothesis, I used logistic regression, in SPSS. Logistical regression assigns a weight to a variable, such as ethnicity, that tells us how important it is in terms of breast cancer survival. It also can tell us how significant this variable is in terms of survival.

RESULTS

TABLE 2 SHOWS THE WEIGHTS AND SIGNIFICANCE LEVELS OF MARITAL STATUS AND RACE IN TERMS OF SURVIVAL.

TABLE 2

	B	Significance
Marital Status	.252	<.001
Race	-.073	<.001
Constant	-.294	<.001

Both of these variables are statistically significant ($p < 0.05$). B is the weight, or slope, and shows how important the variable is in the equation. These results show that marital status and race influence survival.

From this data comes the equation: $\ln(Y) = -.254 + (-.073) \text{ Race} + .252(\text{Marital Status})$

To examine more closely what the “B” weights mean, odds for survival rates were calculated. Since results of the equation were significant, the odds of survival by marital status and ethnicity were calculated.

The first calculation for the probability of being single and surviving less than five years was 1.05. If a woman is married, she has slightly greater odds of surviving more than five years. Although these odds are statistically significant, they are not large.

The survival rate for married women within ethnic groups was also examined. Using the same odds ratio equation above, black women who were married were 1.234 times more likely to live less than five years if diagnosed with breast cancer.

This finding is not consistent with the overall findings. Also, black women who were single were 1.338 times more likely to live more than five years compared to black women who were married. This also is not consistent with the overall results. In the overall results, the subjects are mainly white.

For white women who were married, the odds of surviving more than five years was 1.16 times more likely to survive compared to single white women.

American Indian and Alaska natives who were married were 1.06 times more likely to live less than five years. This is not consistent with the overall results either.

Finally, married Asian women are 2.03 times more likely to live more than five years than single women.

In sum, in terms of probability of surviving more than five years for married women, the odds were significant for white and Asian women but not for black and American Indian women.

DISCUSSION

Marital status and race are both important in survival odds. Overall, married women are more likely to survive breast cancer. White and Asian women who are married are slightly more likely to survive breast cancer than single white and Asian women. Black

and Magnusson: Finally, Marriage Pays Off: Marital Status and Breast Cancer Survival
than single black and American Indian women. The results for white and Asian women are consistent with the overall findings, but the results for black and American Indian women are not.

It is possible that married women survive longer because of emotional support and care. If a woman is married, she may be more likely to take preventive action, especially if she has children. Married women may also have more treatment and options for better care because of less financial worry.

Black women may not survive as long because as a group they have poorer health care, which leads to less treatment and financial worry. This doesn't really explain why single women survive longer than married women.

Further studies might examine reasons why single black women survive longer than married black women. Another might be to study the treatment choices of single and married women. A study could also be done on marital status and survival, but distinguish between young and old women, since older women do not survive as long.

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