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Gabrielle Black Date

Factors Associated with Hormonal Contraception Choice Among Female Cancer Survivors

By

Gabrielle R. Black
Master of Public Health

Epidemiology

_____

Penelope P. Howards, Ph.D.
Committee Chair

# Factors Associated with Hormonal Contraception Choice Among Female Cancer Survivors

By

Gabrielle R. Black

Bachelor of Science
University of North Carolina Wilmington
2020

Thesis Committee Chair: Penelope P. Howards, Ph.D.

An abstract of
A thesis submitted to the Faculty of the
Rollins School of Public Health of Emory University
in partial fulfillment of the requirements for the degree of
Master of Public Health
in Epidemiology
2023

# Abstract

Factors Associated with Hormonal Contraception Choice Among Female Cancer Survivors
By Gabrielle R. Black

Cancer survivors of reproductive age are a unique population with specific contraceptive needs. This study aims to examine contraceptive use among cancer survivors to women who have not had cancer and to determine what characteristics of cancer survivors are associated with the decision to use hormonal contraception. Female cancer survivors (n= 1,282) aged 22–45 years, who were diagnosed in Georgia from 1990 to 2009, between ages 20–35 years and at least 2 years post diagnosis, and comparison women with no history of cancer (n= 1,073) completed an interview about their contraceptive and reproductive histories, including type of contraception used. Adjusted logistic regression models were fit to examine hormonal contraceptive use in the past 12 months among cancer survivors and comparison women. Multiple logistic regression models were fit to access the association between sociodemographic and survivorship characteristic and hormonal contraception use in the past 12 months among cancer survivors. After adjusting for confounding by age at interview and race, cancer survivors were less likely to use hormonal contraception in the past 12 months compared to the comparison women (Adjusted Odds Ratio [aOR:] 0.59, 95% confidence interval [CI]:0.48-0.73). In unadjusted models, factors associated with a higher use of hormonal contraception in the past 12 months in cancer survivors included being <30 at diagnosis (Odds Ratio [OR]: 2.53, 95% CI: 1.83-3.45; referent: >30 at diagnosis), achieving desired family size prior to diagnosis (OR:1.58, 95% CI: 1.07-2.31), and having children after the cancer diagnosis (OR: 1.38, 95% CI: 1.01-1.88). Factors associated with a lower use of hormonal contraception in the past 12 months were receiving chemotherapy (OR: 0.56, 95% CI: 0.34-0.62), receiving radiation (OR: 0.58, 95% CI: 0.43-0.78), having children before cancer diagnosis (OR: 0.44, 95% CI: 0.32-0.61), being obese (OR: 0.60, 95% CI:0.41-0.89; referent: underweight/normal), and black race (OR: 0.34, 95% CI: 0.27-0.59; referent: white). Cancer survivors may benefit from contraceptive counseling addressing concerns with the use of certain methods.

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**Acknowledgements**

I would like to thank Dr. Howards for her support throughout my entire thesis. She has been incredibly responsive to any questions and provided excellent guidance during this past year. This has been a great learning experience having her as a mentor and advisor.

Finally, I would like to thank my family and friends for their endless support and encouragement.

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# CHAPTER 1 LITERATURE REVIEW

## Introduction

With the improvements in treatment regimens, people with cancer are living longer after their cancer diagnosis. However, treatments have long-term side effects and cancer survivors may take adjuvant therapy that also have side effects. For pre-menopausal cancer survivors, reproductive health is important, as some cancer treatments can cause infertility.[1] Most cancer survivors remain fertile.[2] Increasingly, reproductive-aged cancer survivors receive fertility counseling that explains the risk of future infertility and presents fertility preservation options. However, cancer survivors receiving counseling specifically about contraception is less common. As a result, many cancer survivors are confused regarding the contraception options that are appropriate for them. Cancer survivors need reliable and effective contraception to prevent unplanned pregnancies. The emphasis placed on fertility counseling leads some cancer survivors to mistakenly believe they do not need to use contraception.[3] Survivors of hormone sensitive cancers have concerns that using hormonal contraception, some of the most effective methods, will lead to a recurrence of their cancer. [3] Uncertainty around the need for contraception and the safety of different methods leads to cancer survivors having an increased risk of unplanned pregnancy. [3] The aims of this research are to compare contraceptive use among cancer survivors to women who have not had cancer and to determine what characteristics of cancer survivors are associated with the decision to use hormonal contraception.

## Contraception

Women choosing contraceptive methods should understand the benefits and risks associated with each type of contraceptive available to come to a decision about which method is right for them. The World Health Organization (WHO) established a four-tier system to classify methods

of contraception. Tier I is for long-lasting and most effective methods, such as vasectomy and tubal ligation, hormonal implants, and copper and progesterone intrauterine devices (IUD).[4] Long-acting reversible contraception (LARC) are tier I methods that include both copper and progesterone IUDs, as well as implants.[5] The failure rate for tier I methods are typically around less than 1% per year.[4] Tier II methods have a shorter duration. This includes hormonal contraceptives in a variety of forms, such as combined oral contraceptives (COCs), progestogen-only pills (POPs), patches, injections, and combined vaginal rings (CVR) with a failure rate of around 6%-12% per year.[4] Tiers I and II consist of all the hormonal contraceptive methods, except for the copper IUD, vasectomy, and tubal ligation.[5] Tier III is for barrier methods, that are non-hormonal, such as condoms and sponges. The failure rate is higher at about 18% to 24% per year.[4] Tier IV is for behavioral methods, such as the calendar-based rhythm method and coitus interruptus (withdrawal methods) which have failure rates greater than 24% per year.[4] The most effective methods for pregnancy prevention are IUDs and implants with less than one woman per 100 each year experiencing an unintended pregnancies.[6]

In a national survey, from 2017 to 2019, covering 45 jurisdictions within the United States, among women who used contraceptives at their last sexual encounter, 15.2% used a long-acting method (an IUD or contraceptive implant) and 25% used a short-acting method (injectable, pill, patch, or vaginal ring).[5] Over 30% of women were not using any type of contraceptive method. [5] The proportion of women who used contraception did vary by age group, race, and urban status, with a much higher need for contraceptive services among 18–24-year-olds, for Black, non-Hispanic women and Hispanic women compared to White, non-Hispanic women, and women in urban areas. Puerto Rico had the lowest percent of women using long and short-acting reversible contraceptive methods, and therefore, the largest number of women using no contraceptive

method. Insurance coverage did not seem to impact the proportion of women utilizing contraception. [5]

A study examining unintended pregnancy and use of hormonal contraception at last sexual encounter among veterans found non-Hispanic Black women to have the highest likelihood of unintended pregnancy compared to non-Hispanic White women. However, there was a similar proportion of women across race/ethnicity groups using any method of contraception at their last sexual encounter, although use of prescription hormonal contraceptives was lowest among Hispanic Black women and highest among non-Hispanic White women, 65% and 77%, respectively.[7] Additionally, in this group of veterans, 19% used an IUD, 17% had female surgical sterilization, and 16% used birth control pills. [7] The most commonly used method among Hispanic, non-Hispanic White, and other non-Hispanic women was the IUD, while female surgical sterilization was the most commonly used method for non-Hispanic Black women.[7]

**Epidemiology of Cancer Among Reproductive Aged Women**

In the United States (US), the annual incidence rate of cancer, as of 2016, for women 20-29 and 30-39 years was 54.9 and 161.3 per 100,000, respectively.[8] The most common types of cancer diagnosed among women ages 20-39 years within the US were breast, thyroid, melanoma, uterine, Hodgkin's Lymphoma (HL), and colon and rectum cancers.[8,9] The 5-year survival rate for breast cancer in women ages 20-29 years is 83% and 86% for women 30-39 years.[8] The overall 5-year survival rate for women 20-39 years for HL is 86%, 92% for melanoma, 81% for uterine cancer, 65% for colorectal cancer, and 98% for thyroid cancer.[10] As of 2019, there are approximately 3.4 million female cancer survivors between ages 20-64 in the US and 976,000 (17%) of these survivors are of reproductive age.[10,11] For women of all ages, breast cancer has the largest number of survivors, 3.6 million in the US.[11] Non-Hispanic American Indian and

Alaska Native women ages 15-39 years have the highest incidence rate of cancer with 123.8 diagnoses per 100,000, followed by non-Hispanic, White women with 107.8 diagnoses per 100,000, and non-Hispanic Black women with 80.7 diagnoses per 100,000.[8,12] For most cancers, Black women have a lower 5-year survival than White women.[10] For example, White women have a proportionally higher 5-year survival rate in uterine cancer, at every stage, compared to Black women (83% to 62%). [10]

The number of cancer survivors continues to grow with improvements in early detection and advanced treatments, emphasizing the importance of the long-term health of cancer survivors. The American Cancer Society predicts that by 2030 there will be around 3.8 million survivors of breast cancer and around 11.1 million cancer survivors from all types of cancer in the US.[11] Since so many of these cancer survivors are of reproductive age, family planning is essential for these women. However, awareness of contraceptive methods among cancer survivors remains low.[3]

**Contraceptive Choice After Cancer**

Contraceptive choice among cancer survivors can differ from women in the general population because of concerns about cancer recurrence due to the use of hormones and perceptions of infertility resulting from fertility counseling. In a 2015 study that compared self-reported contraceptive use among cancer survivors aged 20 to 44 years recruited through social media, cancer advocacy groups, and fertility preservation programs (n=289) to contraceptive use reported by reproductive aged women from the National Survey for Family Growth (NSFG), cancer survivors were less likely to report use of any contraception (57% vs. 69%).[3] In a study of cancer survivors recruited from the California Cancer Registry who received potentially gonadotoxic treatment, only 46.6% reported using any method of contraception.[13] However, in a

study that also recruited cancer survivors from the California Cancer Registry as well as the Texas Cancer Registry, a San Diego, California Health System, and cancer advocacy groups, 84% of sexually active women not attempting pregnancy with a cancer diagnosis between the ages of 15-35 reported using any form of contraception.[2] Further, among those using contraception, tier I methods were used by 36%, tier II were used by 23%, and 29% used tier III.[2] The most common type of contraception among cancer survivors were barrier/withdrawal methods followed by combined hormonal contraceptives.[2,3] Efficacy and ease of use were the primary reasons that survivors picked the highly effective methods.[2] In contrast, the lack of hormones was the primary reason women picked less-effective methods.[2]

Permanent contraceptive methods, including tubal ligation, are tier I methods. In 2016, in the US, the most popular methods of contraception among reproductive-aged women in the general population were tubal ligation and oral contraceptive pills, with 22% of women utilizing each method[14]. Similarly, 21% of cancer survivors reported using oral contraceptive pills in a 2010 survey of cancer survivors recruited from the California Cancer Registry,[13] but only 10.2% of cancer survivors reported having a tubal ligation in a study of that recruited cancer survivors from the Georgia Cancer Registry in 2012-2013.[15] In contrast, in a 2015 study that compared self-reported contraceptive use among cancer survivors aged 20 to 44 years (n=289) to contraceptive use reported by reproductive aged women from the NSFG, cancer survivors were substantially more likely to report being surgically sterile (8% to 0.4%).[3] However, this may be partially due to the inclusion of survivors of reproductive cancers, who may become surgically sterile as a result of their treatment.

The use of tier I and II contraception among cancer survivors varies across studies. In a study of cancer survivors recruited through social media, cancer advocacy groups, and fertility

preservation programs, cancer survivors were less likely to report tier I and II contraception use (34%) compared to participants in the NSFG (53%).[3] This difference was driven by lower contraception rates among 30-34-year-old and 35-39-year-old cancer survivors compared to women of in those age groups in the general population.[3] However, in another study that included cancer survivors recruited from California Cancer Registry as well as the Texas Cancer Registry, a San Diego, California Health System, and cancer advocacy groups, almost 50% of sexually active cancer survivors not attempting pregnancy used Tier I and II methods. In contrast, in a 2014 survey that also recruited cancer survivors from the California Cancer Registry, only 24.5% of cancer survivors reported using hormonal contraceptive methods compared with 35% of the general population as report in by the Guttmacher Institute.[13]

Fertility counseling is recommended for all reproductive-aged cancer patients because the cancer treatments may have adverse effects on cancer survivor's fertility. The American Society of Clinical Oncology (ASCO) recommends that health care providers initiate the conversation of possible infertility for reproductive-aged cancer patients as early as possible. Health care providers should also be ready to discuss fertility preservation and/or refer patients to reproductive specialists.[16] The emphasis on fertility counseling may give some cancer survivors the impression that they will be infertile after cancer treatment, even though most women continue to remain fertile.[17]

Perceived fertility among cancer survivors can impact contraception selection. In a study that recruited participants from the California and Texas Cancer Registries, as well as a San Diego, California Health System and cancer advocacy groups, women with a cancer diagnosis between the ages of 15-35 were asked how they felt about their fertility compared to other women their age in four categories: infertile, less fertile, as fertile, and more fertile. Contraception use was

lowest among those who perceived themselves as infertile (61%), higher among those who perceived themselves as less fertile (89%), and highest among those who perceived themselves as more fertile (91%)[2] although contraceptive use was higher in this study overall (84%) than other studies of cancer survivors.[2] In contrast, in another study that recruited cancer survivors from the California Cancer Registry, the proportion of women having unprotected sex who were not trying to conceive was the same for women who received fertility counseling prior to cancer treatment and those who did not. [13] Similarly, a study conducted in Mexico, among breast cancer patients (n=104) undergoing various treatments reported that patients experiencing amenorrhea believe that their treatment has caused infertility and do not feel the need to use contraception at this time. While receiving chemotherapy, 51% of women reported contraception use.[4] Approximately 29% of the women who reported sexual activity used a tier I contraceptive method.[4]

Contraceptive counseling for cancer survivors is less common than fertility counseling, and contraceptive choice after contraceptive counseling among female cancer survivors has a varied pattern. In a study conducted in Mexico, only 17% of breast cancer patients remembered being advised by a medical professional about use of a contraception method during cancer treatment.[4] These breast cancer patients reported wanting more information about safe and effective contraceptive methods. [4] A 2014 survey reported 65% of cancer survivors received contraceptive counseling prior to beginning cancer treatment.[18] Similarly, only half of the cancer survivors in a 2015 study reported receiving contraception-related counseling since cancer diagnosis.[3] The cancer survivors that received contraceptive counseling were more likely to use tier I or tier II methods.[3] While in a study that recruited breast cancer survivor through social media sites, 23% of women reported that they did not speak with their medical provider about the need for

contraceptives after their cancer diagnosis.[19] The cancer survivors that did discuss contraceptives most often reported their oncologist and/or gynecologist initiated the conversations.[19] Further, a 2019 study, reviewed contraceptive counseling patterns among women under the age of 40 with previous breast (n=95) or gynecologic cancer (n=185) diagnoses who were seen at an Oncofertility unit.[20] All eligible women at the clinic received contraceptive counseling, but only 3.2% initiated the discussion.[20] In a survey of among gynecologic oncologists, only 34.6% reported sometimes or always providing both fertility and contraception counseling.[21]

In that study, 52.4% of cancer survivors under the age of 40 years selected prescription hormonal contraceptive methods after contraceptive counseling, with 28% using the vaginal ring, 22% using a COC and 2% using a patch.[20] The cancer survivors reported that the vaginal ring was preferred over other hormonal methods because it was seen as being as effective, but less intrusive than a daily pill.[20] However, among the cancer survivors without contraindications for hormonal contraception, 44% decided against the use of hormonal contraception with half of those women indicating fear of the hormones as the reason, even after counseling expressed the safety of the contraception methods.[20] Further, among cancer survivors without contraindications for hormonal contraception, those over the age of 33 years at diagnosis were less likely to select LARCs, whereas those in a relationship were more likely to select LARCS.[20] Similarly, another study reported that cancer survivors receiving contraceptive counseling were 6 times more likely to use of tier I/II methods compared to those that did not report receiving contraceptive counseling (OR:6.92, 95% CI: 1.14-42.11).[18]

Hormonal contraception is not recommended for people diagnosed with hormone sensitive cancers, so the copper IUD is the only LARC available to breast cancer survivors. Among the 95 breast cancer survivors who received counseling at an Oncofertility clinic, 3% selected a copper

IUD with the rest opting for barrier methods.[20] A 2019 study examined breast cancer survivors self-reported contraceptive use and contraceptive communication before, during, and after primary cancer treatment (n=150).[19] The most used contraceptive methods 12 months prior to cancer treatment were COCs, the patch, vaginal rings, and injectables. However, during and after cancer treatment, male condoms were most used contraceptive method. Breast cancer survivors tended to switch from higher tier (hormonal methods) to lower tier (nonhormonal) methods; reporting the primary motivation behind selecting a contraception method during and after cancer treatment involved safety concerns. Additionally, 63% of breast cancer survivors did not use contraception because believed they were unable to get pregnant during cancer treatment and 71% did not use contraception because believed they were unable to get pregnant after cancer treatment.[19]

**Summary**

Many factors lead to a cancer survivors' choice of contraception. Medical providers can help inform cancer survivors' contraceptive choices, but there may be a communication gap between providers and cancer survivors leading to unclear impressions about their options and the safety and effectiveness of different contraceptive choices. Cancer survivors may desire guidance on contraception from their medical team, but often do not to receive it.[4] As cancer treatments extend lifespan, we need to continue to provide adequate reproductive care for the cancer survivors. Therefore, it is important that we continue to investigate the factors behind choice of different contraception.

Since many studies on cancer survivors and contraception use have been conducted in California, our research contributes to diversifying on the existing literature by focusing on cancer survivors in Georgia. Additionally, our study population has a larger African American/

Black population than many prior studies. Our research addresses a gap in the literature by comparing contraceptive use among cancer survivors to women who have not had cancer and by determining which sociodemographic and survivorship characteristics of cancer survivors are associated with use of different hormonal contraceptive methods.

# CHAPTER 2 FACTORS ASSOCIATED WITH HORMONAL CONTRACEPTION CHOICE AMONG FEMALE CANCER SURVIVORS

## Introduction

With improvements to cancer treatment regimens, cancer survivors are living longer after their diagnosis. Although survivorship is increasing, the treatments have long-term side effects. Further, cancer survivors may need to take adjuvant therapy and adjust their behaviors to decrease the risk of recurrence of cancer for the rest of their lives. For pre-menopausal cancer survivors, the potential effects of cancer treatment on reproductive health are important,[1] but historically there has been a stronger focus on the potential adverse effects of cancer treatment on fertility and less attention to the contraceptive needs of cancer survivors. In a survey of among gynecologic oncologists, only 34.6% reported sometimes or always providing both fertility and contraception counseling.[21] While a review of records at an Oncofertility clinic indicated that only 3.2% of patients initiated a discussion about contraception.[20] However, in a 2015 study, cancer survivors were less likely to use hormonal contraception than participants in the National Survey of Family Growth (69% and 57%, respectively).[3]

Although some cancer treatments could cause infertility, most cancer survivors remain fertile.[2] Increasingly, reproductive-aged cancer survivors receive fertility counseling, which explains the risk of future infertility and presents various fertility preservation options. The emphasis on fertility counseling leads some cancer survivors to mistakenly believe they do not need to use contraception.[3]

Contraceptive counseling is less common than fertility counseling for cancer survivors. As a result, many cancer survivors are confused about which contraception options are appropriate for them. While hormonal contraception is contraindicated for people diagnosed with hormone

sensitive cancers,[22] even some cancer survivors without contraindications fear the use of hormonal contraception, some of the most effective contraceptive methods.[3] Further, survivors of hormone-sensitive cancers are reported to prefer barrier methods to the more effective copper intrauterine device (IUD).[20] Uncertainty around the need for contraception and the safety of different methods may lead cancer survivors to have an increased risk of unplanned pregnancy as suggested by a higher prevalence of emergency contraception use compared with the general population of reproductive aged women.[23]

Our research addresses a gap in the literature by comparing contraceptive use among cancer survivors to women who have not had cancer while adjusting for potential confounders, which has not been possible in prior studies which compared contraceptive choices of cancer survivors to estimates from the NSFG. In addition, we assess which sociodemographic and survivorship characteristics of cancer survivors are associated with the use of different hormonal contraceptive methods among cancer survivors in Georgia, which includes a higher proportion of African American cancer survivors than in prior studies, which have primarily been conducted in California.

## Methods

### *Study Population*

The Furthering Understanding of Cancer, Health, and Survivorship in Adult (FUCHSIA) Women's Study is a population-based study designed to evaluate the effect of a cancer diagnosis during the reproductive years on future fertility. Cancer survivors were identified through the Georgia Cancer Registry (GCR), as described in more detail elsewhere.[24] Eligible cancers included any malignant cancer, except non-melanoma skin cancers, and ductal carcinoma *in situ*. Cancer survivors were eligible if their first cancer diagnosis occurred in Georgia between 1990

and 2009, and they were between the ages of 20 to 35 years at the time of diagnosis. Women were classified as cancer survivors if they were alive two years post cancer diagnosis. Comparison women were identified from a marketing list. Comparison women without a history of cancer were frequency matched to the cancer survivors by age and area of residence. All participants had to be between 22 to 45 years old at enrollment, to have a working telephone, and to be able to complete the interview in English. The main analysis included 2,355 women, 1,282 cancer survivors and 1,073 comparison women. All participants provided informed consent. The Emory University and Georgia Department of Public Health Institutional Review Boards approved this study.

***Procedures***

The study participants completed a detailed telephone interview that included self-report questions on demographic characteristics, cancer history and treatment, fertility, hormonal birth control usage, menstruation, pregnancy history, and lifestyle. Information regarding cancer treatments, such as receiving chemotherapy, or radiation, and cancer history was also abstracted from medical records. Covariates such as type of cancer, age at diagnosis, and time since diagnosis are based on GCR data.

Study participants were asked whether they had ever used a list of different methods of hormonal contraception, including an implant, Depo-Provera, NuvaRing, the patch, an intrauterine device (IUD), progestin-only pills, and combined estrogen-progestin oral contraceptives. For each method they reported ever using, they were asked how old they were when they first used it and whether they had used it in the past 12 months. The use of long-acting reversible contraception (LARCs) was created based on report of the use of a hormone or copper IUD, Depo Provera, or implant.[25,26]

Factors hypothesized to be associated with use of hormonal contraceptive in the past 12 months include age, desire for children, parity, body mass index (BMI), and self-reported race. These covariates were based on information collected from the interview. BMI was calculated as self-reported weight in kilograms divided by height in meters squared. Desire for children in the future was created by comparing the number of children participants reported wanting to raise with the number of children they reported having.

Fertility counseling, type of cancer treatment received, achieving desired family size prior to cancer diagnosis, having children before or after cancer diagnosis, and unplanned pregnancy after cancer diagnosis are the survivorship characteristics of particular interest. The type of cancer treatment received, such as chemotherapy, or radiation were derived from the medical records where possible, supplemented by self-reported treatment and GCR information. Achieving desired family size prior to diagnosis was derived by comparing the number of children participants reported wanting to raise with the number of children they reported having prior to their cancer diagnosis.

***Statistical Analysis***

Descriptive statistics were used to compare the characteristics of the cancer survivors with those of the comparison women. For the analyses of hormonal contraception use in the past 12 months, we excluded women who had a hysterectomy, bilateral oophorectomy, or tubal ligation by the time of the interview. We fit unadjusted and adjusted logistic regression models to determine whether cancer survivors or comparison women were more likely to have used hormonal contraception in the past 12 months. For the adjusted models, potential confounders were identified based on a directed acyclic graph (DAG). In addition, we identified factors strongly associated with the outcome that were not associated with the exposure. Two adjusted

logistic models were fit to examine how the covariates may affect hormonal contraception use in the past 12 months. The first model was adjusted for age at the time of the interview and race. The second model was adjusted for age at the time of the interview, race, BMI, smoking status, and parity.

Several sub analyses were performed among the cancer survivors who had not had a hysterectomy, bilateral oophorectomy, or tubal ligation by the time of the interview. We examined the associations between different survivorship and sociodemographic characteristics and use of hormonal contraception in the 12 months prior to the interview. We fit both unadjusted and adjusted logistic regression models for factors we hypothesized would affect contraception use, including ever receiving chemotherapy or radiation, type of cancer, having children before or after cancer diagnosis, unplanned pregnancy after cancer diagnosis, time since diagnosis, achieved desired family size prior to diagnosis, and conversation about fertility. We assessed potential confounders for each characteristic separately based on a DAG. All models were adjusted for age at diagnosis and race.

## Results

### *Descriptive statistics*

There were 1,282 cancer survivors and 1,073 comparison women who were interviewed. Descriptive characteristics are shown in Table 1. The cancer survivors and comparison women were similar with respect to most sociodemographic characteristics. However, comparison women, were slightly more likely to have pursued graduate education (34.2% vs. 29.9%), to be in a relationship at the time of the interview (76.6% vs. 69.8%) and to have an income over $50,000 (71.8% vs. 64.8%). Approximately 20.1% of cancer survivors reported using hormonal contraception in the past year, compared to 31.1% of comparison women. However, a similar

proportion of cancer survivors and comparison women reported ever use of hormonal contraception (77.5% vs. 82.9%, respectively). Ever use of LARC was similar between the two groups with 18.3% of cancer survivors reporting use and 17.9% of comparison women reporting use. A small proportion of comparison women (7.6%) had a hysterectomy or bilateral oophorectomy by the time of the interview compared with 25.1% of cancer survivors. However, tubal ligation was similar for cancer survivors and comparison women (10.8% vs. 14.1%). Cancer survivors were more likely to be childless at the time of the interview (23.8% vs. 16.1%) but were equally likely to desire children in the future at the time of the interview (95.4% vs. 93.1%, respectively).

Descriptive characteristics of the 1,282-cancer survivor are shown in Table 2. The most prevalent cancers were breast (32.4%), thyroid (9.6%), Hodgkin (nodal) (9.5%), cervical (8.0%), and melanoma (8.0%). Over half of the cancer survivors were between ages 30 to 35 at the time of cancer diagnosis. Approximately 56% of cancer survivors had received chemotherapy and 49% had received radiation. Only 20% of the total cancer survivors reported using hormonal contraception in the past 12 months. Among those using hormonal contraception, combined oral contraceptives were the most common method followed by a hormonal IUD. Approximately, 15% of cancer survivors experienced an unplanned pregnancy after cancer diagnosis. Half of the cancer survivors had at least one child before cancer diagnosis, whereas about 26% of cancer survivors had at least one child after cancer diagnosis. Further, 29% had achieved their desired family size prior to diagnosis. About 60% of cancer survivors had a conversation with a medical professional about how their fertility could be affected by their cancer treatments. Of all breast cancer survivors, 8.6% used a nonhormonal IUD in the past 12 months.

***Factors associated with hormonal contraception use***

There were 631 women who were excluded from this analysis because of receiving a hysterectomy, bilateral oophorectomy, or tubal ligation by the time of the interview. Cancer survivors were less likely to have taken hormonal contraception in the past 12 months than comparison women (Odds Ratio [OR]: 0.64, 95% confidence interval [CI]: 0.59-0.72) (Table 3). After adjusting for confounding by age at interview and race, cancer survivors remained less likely than comparison women to have used hormonal contraception in the past 12 months (Adjusted Odds Ratio [aOR:] 0.59, 95% CI:0.48-0.73). The association did not change after additionally adjusting for parity, BMI, and smoking status (aOR: 0.58, 95% CI:0.46-0.73).

***Factors associated with hormonal contraception use among cancer survivors***

There were 866 cancer survivors who had not had a hysterectomy, bilateral oophorectomy, or tubal ligation by the time of the interview (Table 4). In unadjusted models, factors associated with a higher use of hormonal contraception in the past 12 months in cancer survivors included being under age 30 at diagnosis (OR: 2.53, 95% CI: 1.83-3.45; referent: above age 30 at diagnosis), having children after the cancer diagnosis (OR: 1.38, 95% CI: 1.01-1.88), and achieving desired family size prior to diagnosis (OR:1.58, 95% CI: 1.07-2.31) (Table 4). Factors associated with a lower use of hormonal contraception in the past 12 months in cancer survivors in unadjusted models were receiving chemotherapy (OR: 0.56, 95% CI: 0.34-0.62), receiving radiation (OR: 0.58, 95% CI: 0.43-0.78), having children before cancer diagnosis (OR: 0.44, 95% CI: 0.32-0.61), being obese (OR: 0.60, 95% CI:0.41-0.89; referent: underweight/normal), having an annual income of less than $50,000 (OR:0.69, 95% CI: 0.5-0.96), and Black race (OR: 0.34, 95% CI: 0.27-0.59; referent: White). Those with a breast cancer diagnosis were less likely to use hormonal contraception in the past 12 months (OR: 0.19, 95% CI: 0.11-0.30) compared to the other (referent) cancers, whereas those with a melanoma

diagnosis were more likely to use hormonal contraception in the past 12 months (OR: 1.78, 95% CI: 1.13-2.81). After adjusting for confounders, no associations changed meaningfully between the covariates and hormonal contraception use in the past 12 months.

**Discussion**

Cancer survivors were less likely to report using hormonal contraception in the past 12 months compared with women without a history of cancer, even after accounting for potential confounders. Among cancer survivors, women who were younger at their cancer diagnosis, those who had met their desired family size before diagnosis, and those diagnosed with melanoma were more likely to have used hormonal contraception in the past 12 months. Cancer survivors who ever received chemotherapy, or radiation, had breast cancer, had children before their diagnosis, were obese, had an annual income of less than $50,000, or identified as Black or African American were substantially less likely to have used hormonal contraception in the past 12 months.

Previous literature reported lower rates of contraceptive use in reproductive-aged cancer survivors compared to women in the general population.[3] Our results were similar with fewer cancer survivors using hormonal contraception compared to women in the general population. In a study that primarily recruited cancer advocacy groups, cancer survivors using hormonal contraception were younger at the time of interview and further from their cancer diagnosis, as well as less likely to have had breast cancer.[3] This supports the present findings since hormonal contraception use among cancer survivors in our study was associated with younger age at diagnosis and was also less likely among breast cancer survivors; however, we did not find further time since diagnosis to be associated with hormonal contraceptive use. A previous study conducted on infertility and contraception use in cancer survivors found a history of

chemotherapy and infertility to be associated with a lower use of any contraception method.[2] Our present study also found that cancer survivors who received chemotherapy or radiation were less likely to use hormonal contraception. Similar to our study, other literature investigating associations between contraceptive selection and cancer treatment showed very little use of hormonal contraception in breast cancer survivors,[13] which is likely driven in part by recommendations that women diagnosed with hormone sensitive breast cancer avoid hormonal contraception.[22] For breast cancer survivors, a copper IUD is recommended as a safe, highly effective, long term contraception method.[22] An Oncofertility clinic with breast cancer survivors reporting that only 3% selected a copper IUD with the rest opting for barrier methods.[20] Our breast cancer survivors reported similar results with 8.63% using a nonhormonal IUD in the past 12 months.

A recent study examining contraceptive methods of cancer survivors after treatment found a higher risk for unintended pregnancies compared to the general population, due to a lower use of hormonal contraceptive methods.[13] However, in the present study, a similar proportion of cancer survivors had an unplanned pregnancy after cancer diagnosis among those reporting using and not using hormonal contraception use in the past 12 months.

This study has many strengths. For our analysis comparing cancer survivors to women without a history of cancer, we had a large sample size. Instead of using an external comparison group, we recruited women without a history of cancer who were frequency matched to cancer survivors on age and area of residence, which improved comparability between our comparison women and cancer survivors. Further, by recruiting comparison women, we were able to collect detailed information about their sociodemographic characteristics and reproductive health, which we could use to adjust our analysis. This study included survivors of various types of cancers in

the main analyses improving generalizability across the cancer survivor population. Clinical questions asked in the interview were cross-checked with the medical records, such as ever having chemotherapy, or radiation to ensure higher accuracy.

This study has several limitations. Most of the data obtained was based on self-report. Self-report data may not be as accurate as medical records or other forms of data collection due to the individual's ability to remember details of life events. All the interview data were collected at a single time point, which can introduce recall bias since some of the women were asked questions from up to ten years prior. Because these women were interviewed at varying times since their cancer diagnosis, survivor bias could have impacted the study. Only women who survived long enough after their diagnosis to be interviewed were included. Lastly, there may be a lack of generalizability from this study to other locations, since the study population only included residents of Georgia.

**Conclusion**

This study contributes to current literature by describing the association of sociodemographic and survivorship factors with hormonal contraception use among female cancer survivors. There are many factors leading to a cancer survivors' choice of contraception. Medical professionals can help inform patients' contraceptive choices, but there may be a communication gap between providers and cancer survivors leading to unclear impressions about their options. Additionally, future research on counseling for cancer survivors with fewer resources could aid in closing this gap because this group is less likely to use hormonal contraception.

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**Table 1.**

Demographic characteristics of study population who participated in the survey by cancer survivorship status, 2012-2013

| | Cancer Survivors (n=1282) | Comparison Women (n=1073) |
|---|---|---|
| | n (%) | n (%) |
| **Age at interview** | | |
| 22-29 | 81 (6.3%) | 72 (6.7%) |
| 30-34 | 232 (18.1%) | 158 (14.7%) |
| 35-39 | 469 (36.7%) | 418 (39.9%) |
| 40-45 | 500 (39.0%) | 425 (39.6%) |
| **Race** [a] | | |
| White | 922 (72.4%) | 737 (69.2%) |
| Black | 332 (26.1%) | 314 (29.5%) |
| Other Races | 19 (1.5%) | 14 (1.3%) |
| Missing | 9 | 8 |
| **Ethnicity** | | |
| Hispanic/Latina | 43 (3.4%) | 39 (3.6%) |
| Non-Hispanic/Latina | 1238 (96.6%) | 1033 (96.4%) |
| Missing | 1 | 1 |
| **BMI Categories** [b] | | |
| Underweight | 16 (1.3%) | 20 (1.9%) |
| Normal | 565 (44.3%) | 434 (40.7%) |
| Overweight | 322 (25.2%) | 308 (28.9%) |
| Obese | 373 (29.2%) | 305 (28.6%) |
| Missing | 6 | 6 |
| **Identified as a Current Smoker** | | |
| Current | 70 (5.5%) | 78 (7.3%) |
| Never/Former | 1210 (94.5%) | 995 (92.7%) |
| Missing | 2 | 0 |
| **Education Level** | | |
| High School Grad or less | 98 (7.7%) | 52 (4.9%) |
| Some College | 343 (26.8%) | 257 (24.0%) |
| College Graduate | 461 (36.0%) | 396 (36.9%) |
| Some Grad School or grad degree | 379 (29.9%) | 367 (34.2%) |
| Missing | 1 | 1 |
| **Urban Status at time of interview** | | |
| Nonmetropolitan area | 127 (9.9%) | 113 (10.5%) |
| Metropolitan | 1154 (90.1%) | 960 (89.5%) |
| Missing | 1 | 0 |
| **In a relationship at the time of interview** | | |
| Yes | 895 (69.8%) | 822 (76.6%) |
| No | 387 (30.2%) | 251 (23.4%) |

| | | |
|---|---|---|
| **Income Level** | | |
| Annual Income less than 50k | 447 (35.2%) | 299 (28.2%) |
| Annual Income more than 50k | 822 (64.8%) | 760 (71.8%) |
| Missing | 13 | 14 |
| **Ever Hormonal Contraceptive Use [c]** | | |
| Yes | 989 (77.5%) | 888 (82.9%) |
| No | 287 (22.5%) | 183 (17.1%) |
| Missing | 6 | 2 |
| **Ever LARC Use [d]** | | |
| Yes | 234 (18.3%) | 192 (17.9%) |
| No | 1042 (81.7%) | 879 (82.1%) |
| Missing | 6 | 2 |
| **Used hormonal contraception in the last 12 months [c]** | | |
| Yes | 258 (20.1%) | 334 (31.1%) |
| No | 1024 (79.9%) | 739 (68.9%) |
| **Had hysterectomy or bilateral oophorectomy at interview** | | |
| Yes | 322 (25.1%) | 81 (7.6%) |
| No | 960 (74.9%) | 992 (92.4%) |
| **Endometriosis** | | |
| Yes | 140 (11.0%) | 93 (8.7%) |
| No | 1138 (89.0%) | 977 (91.3%) |
| Missing | 4 | 3 |
| **Polycystic Ovary Syndrome (PCOS)** | | |
| Yes | 99 (7.8%) | 84 (7.9%) |
| No | 1170 (92.2%) | 985 (92.1%) |
| Missing | 13 | 4 |
| **Parity at time of interview** | | |
| 0 | 305 (23.8%) | 173 (16.1%) |
| 1 | 223 (17.4%) | 144 (13.4%) |
| 2 | 316 (24.7%) | 299 (27.9%) |
| 3 | 234 (18.3%) | 229 (21.4%) |
| 4-15 | 203 (15.8%) | 227 (21.2%) |
| Missing | 1 | 1 |
| **Desired Children in the future** | | |
| Yes | 1152 (93.1%) | 992 (95.4%) |
| No | 86 (6.9%) | 48 (4.6%) |
| Missing | 44 | 33 |
| **Tubal Ligation** | | |
| Yes | 138 (10.8%) | 151 (14.1%) |
| No | 1144 (89.2%) | 922 (85.9%) |

[a] Race category ‘‘other’’ includes Asian, American Indian, Alaskan Native, Native Hawaiian, and Pacific Islander

[b] BMI: Body Mass Index. BMI was calculated as self-reported weight in kilograms divided by height in meters squared. Underweight: BMI <18.5; Normal weight: 18.5 -24.9; Overweight: 25- 29.9; Obese: BMI <= 30

[c] Contraception included report of use of a hormone intrauterine device (IUD), oral contraceptives (combined or progesterone only), patches, vaginal ring, Depo Provera, or the subdermal implant.

[d] LARC: Long-Acting Reversible Contraception: use of a hormone or copper IUD, Depo Provera, or implant

**Table 2.**

Descriptive Statistics of Cancer Survivors who participated in the survey, 2012-2013

| | n (%) |
|---|---|
| **Type of Cancer** | |
| Breast | 415 (32.4%) |
| Cervix Uteri | 103 (8.0%) |
| Hodgkin (Nodal) | 122 (9.5%) |
| Ovarian | 38 (3.0%) |
| Brain | 31(2.4%) |
| Colon | 47 (3.7%) |
| Corpus Uteri | 32 (2.5%) |
| NHL (Nodal) [a] | 39(3.0%) |
| Soft Tissue | 50 (3.9%) |
| NHL (Extra nodal) [a] | 20 (1.6%) |
| Melanoma | 102 (8.0%) |
| Thyroid | 123 (9.6%) |
| Other | 38 (3.0%) |
| Kidney | 26 (2.0%) |
| Leukemia | 45 (3.5%) |
| Lung | 9 (0.7%) |
| Placenta | 10 (0.8%) |
| Head and Neck | 26 (2.0%) |
| Vaginal | 6 (0.5%) |
| **Age at Diagnosis** | |
| 20-24 | 179 (13.9%) |
| 25-29 | 396 (30.9%) |
| 30-35 | 707 (55.2%) |
| **Time since diagnosis** | |
| 0-4 years | 262 (20.4%) |
| 5-7 years | 399 (31.1%) |
| 8-10 years | 280 (21.8%) |
| 11+ years | 341 (26.6%) |
| **Ever received chemotherapy** | |
| Yes | 706 (56.4%) |
| No | 545 (43.6%) |
| Missing | 31 |
| **Ever received radiation** | |
| Yes | 614 (48.7%) |
| No | 647 (51.3%) |
| Missing | 21 |

| | |
|---|---|
| **Used Hormonal Contraception in Past 12 months** [b] | |
| No | 1024 (79.9%) |
| Combined Oral Contraceptives | 135 (10.5%) |
| Implant | 1 (0.1%) |
| Depo-Provera | 9(0.7%) |
| IUD (unk) [c] | 2 (0.2%) |
| Levonorgestrel-releasing IUD | 71(5.5%) |
| NuvaRing | 10 (0.8%) |
| Progestin-only Pills | 8 (0.6%) |
| The patch | 4 (0.3%) |
| More than one | 18 (1.4%) |
| **Unplanned Pregnancy After Cancer Diagnosis** | |
| Yes | 186 (14.5%) |
| No | 1096 (85.5%) |
| **Any children before cancer** | |
| Yes | 642 (50.1%) |
| No | 600 (49.9%) |
| **Any children after cancer** | |
| Yes | 336 (26.2%) |
| No | 946 (73.8%) |
| **Achieved desired family size prior to diagnosis** | |
| Yes | 361(28.6%) |
| No | 901 (71.2%) |
| Missing | 20 |
| **Conversation about fertility affected by cancer treatment** | |
| Yes | 765 (59.7%) |
| No | 517 (40.3%) |

[a] NHL- Non-Hodgkin Lymphoma

[b] Contraception included report of use of a hormone intrauterine device, oral contraceptives (combined or progesterone only), patches, vaginal ring, Depo Provera, or the subdermal implant.

[c] Did not know whether IUD contained hormones

**Table 3.**

Participants by whether they reported using hormonal contraception in the past 12 months among women who had not had a hysterectomy, bilateral oophorectomy, or tubal ligation by the time of interview with adjusted and unadjusted odds ratios for factors associated with hormonal contraception in past 12 months.

| | **Hormonal Contraception Use Past 12 Months [a]** | | **No Hormonal Contraception Use in Past 12 Months** | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | (n= 559) | | (n=1165) | | | | | | | |
| | n | % | n | % | OR | 95% CI | aOR[b] | 95%CI | aOR[c] | 95% CI |
| **Cancer Survivors** | 239 | 42.80% | 627 | 53.80% | 0.64 | 0.52-0.79 | 0.59 | 0.48-0.73 | 0.58 | 0.46-0.73 |
| **Comparison Women** | 320 | 57.20% | 538 | 46.20% | ref | | ref | | ref | |

[a] Contraception included report of use of a hormone intrauterine device, oral contraceptives (combined or progesterone only), patches, vaginal ring, Depo Provera, or the subdermal implant

[b] Model was adjusted for age at interview and race

[c] Model was adjusted for age at interview, race, parity, BMI, and smoking.

95% CI, 95% Confidence Interval; OR, odds ratio; aOR, adjusted odds ratio

## Table 4.

Cancer survivors by whether they reported using hormonal contraception in the past 12 months among survivors who had not had a hysterectomy, bilateral oophorectomy, or tubal ligation with adjusted and unadjusted odds ratios for factors associated with hormonal contraception use in past 12 months

| | **Use of hormonal contraception in past 12 months [a]** | | **No hormonal contraception use in past 12 months** | | | | | |
|---|---|---|---|---|---|---|---|---|
| | (n= 239) | | (n=627) | | | | | |
| | n | % | n | % | OR | 95% CI | aOR[b] | 95%CI |
| **Age at Diagnosis** | | | | | | | | |
| 20-29 | 161 | 67.40% | 282 | 45.00% | 2.53 | 1.85-3.45 | 2.42 | 1.76-3.31 |
| 30-35 | 78 | 32.60% | 345 | 55.00% | ref | | ref | |
| **Time since diagnosis** | | | | | | | | |
| 0-7 years | 128 | 53.60% | 330 | 52.60% | 1.04 | 0.77-1.40 | 1.26 | 0.92-1.73 |
| 8+ years | 111 | 46.40% | 297 | 47.40% | ref | | ref | |
| **Type of Cancer** | | | | | | | | |
| Breast | 21 | 8.80% | 234 | 37.30% | 0.19 | 0.11-0.30 | 0.24 | 0.14-0.40 |
| Cervix Uteri | 7 | 2.90% | 20 | 3.20% | 0.72 | 0.30-1.75 | 0.73 | 0.30-1.82 |
| Melanoma | 44 | 18.40% | 51 | 8.10% | 1.78 | 1.13-2.81 | 1.80 | 1.11-2.91 |
| Thyroid | 42 | 17.60% | 64 | 10.20% | 1.36 | 0.87-2.11 | 1.55 | 0.98-2.46 |
| Other [c] | 125 | 52.30% | 258 | 41.20% | ref | | ref | |
| **Ever had Chemotherapy** | | | | | | | | |
| Yes | 96 | 40.80% | 369 | 60.10% | 0.56 | 0.34-0.62 | 0.52 | 0.38-0.72 |
| No | 139 | 59.20% | 245 | 39.90% | ref | | ref | |
| **Ever had Radiation** | | | | | | | | |
| Yes | 96 | 40.90% | 337 | 54.50% | 0.58 | 0.43-0.78 | 0.64 | 0.47-0.87 |
| No | 139 | 59.10% | 281 | 45.50% | ref | | ref | |
| **Unplanned Pregnancy After Cancer Diagnosis** | | | | | | | | |
| Yes | 42 | 17.60% | 112 | 17.90% | 0.98 | 0.66-1.45 | 0.90 | 0.60-1.36 |
| No | 197 | 82.40% | 515 | 82.10% | ref | | ref | |
| **Any kids before cancer** | | | | | | | | |
| Yes | 61 | 25.50% | 275 | 43.90% | 0.44 | 0.32-0.61 | 0.57 | 0.40-0.81 |
| No | 178 | 74.50% | 352 | 56.10% | ref | | ref | |
| **Any kids after cancer** | | | | | | | | |
| Yes | 89 | 37.20% | 189 | 30.00% | 1.38 | 1.01-1.88 | 1.05 | 0.75-1.46 |
| No | 150 | 62.80% | 438 | 70.00% | ref | | ref | |
| **Achieved desired family size prior to diagnosis** | | | | | | | | |
| Yes | 41 | 17.50% | 155 | 25.00% | 1.58 | 1.07-2.31 | 1.17 | 0.77-1.76 |
| No | 194 | 82.60% | 465 | 75.00% | ref | | ref | |
| **Conversation about fertility affected by cancer treatment** | | | | | | | | |
| Yes | 141 | 59.00% | 394 | 62.80% | 0.85 | 0.63-1.15 | 0.86 | 0.63-1.17 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| No | 98 | 41.00% | 233 | 37.20% | ref | | ref | |
| **Parity** | | | | | | | | |
| 1 or more | 140 | 58.60% | 413 | 65.90% | 0.73 | 0.54-1.00 | 0.81 | 0.59-1.12 |
| 0 | 99 | 41.40% | 214 | 34.10% | ref | | ref | |
| **BMI Categories [d]** | | | | | | | | |
| Underweight/Normal | 133 | 55.90% | 293 | 47.00% | ref | | ref | |
| Overweight | 59 | 24.80% | 162 | 26.00% | 0.80 | 0.56-1.15 | 0.89 | 0.61-1.29 |
| Obese | 46 | 19.30% | 168 | 27.00% | 0.60 | 0.41-0.89 | 0.71 | 0.48-1.07 |
| **Education Level** | | | | | | | | |
| High School Grad or less | 5 | 2.10% | 41 | 6.60% | 0.30 | 0.12-0.78 | 0.32 | 0.12-0.84 |
| Some College | 46 | 19.20% | 152 | 24.30% | 0.74 | 0.49-1.11 | 0.86 | 0.57-1.31 |
| College Graduate | 98 | 41.00% | 240 | 38.30% | ref | | ref | |
| Some Grad School or Grad Degree | 90 | 37.70% | 193 | 30.80% | 1.14 | 0.81-1.61 | 1.23 | 0.86-1.75 |
| **Urban Status at time of interview** | | | | | | | | |
| Nonmetropolitan area | 19 | 7.90% | 43 | 6.90% | ref | | ref | |
| Metropolitan | 220 | 92.10% | 584 | 93.10% | 0.85 | 0.49- 1.50 | 0.90 | 0.50-1.61 |
| **In a relationship at time of interview** | | | | | | | | |
| Yes | 169 | 70.70% | 434 | 69.20% | 1.07 | 0.78-1.49 | 0.94 | 0.66-1.34 |
| No | 70 | 29.30% | 193 | 30.80% | ref | | ref | |
| **Income Level** | | | | | | | | |
| Annual Income less than 50k | 65 | 27.30% | 219 | 35.30% | 0.69 | 0.50-0.96 | 0.85 | 0.59-1.23 |
| Annual Income more than 50k | 173 | 72.70% | 401 | 64.70% | ref | | ref | |
| **Race** | | | | | | | | |
| White | 197 | 82.80% | 419 | 67.30% | ref | | ref | |
| Black | 36 | 15.10% | 192 | 30.90% | 0.34 | 0.27-0.59 | 0.42 | 0.28-0.62 |
| Other Races [e] | 5 | 2.10% | 11 | 1.80% | 0.97 | 0.33-2.82 | 1.00 | 0.33-2.97 |

[a] Contraception included report of use of a hormone intrauterine device, oral contraceptives (combined or progesterone only), patches, vaginal ring, Depo Provera, or the subdermal implant.

[b] Models for time since diagnosis, ever had chemotherapy, ever had radiation, unplanned pregnancy after cancer diagnosis, any kids before cancer, any kids after cancer, achieved desired family size prior to diagnosis, conversation about fertility affected by cancer treatment, education level, urban status at time of interview, and relationship status at the time of interview were adjusted for age at diagnosis and race. Model for age at diagnosis was adjusted for race. Model for BMI categories was adjusted for age at diagnosis, race, and parity. Model for income level at time of interview was adjusted for age at diagnosis, race, and education at time of interview. Model for race was adjusted for age at diagnosis. Model for parity was adjusted for age at diagnosis, race, achieved desired family size prior to diagnosis, and BMI. Model for type of cancer was adjusted for age at diagnosis, race, and age at interview.

[c] "Other" cancers include NHL (nodal), ovarian, brain, colon, corpus uteri, Hodgkin (Nodal), soft tissue, NHL (extra nodal) Kidney, Leukemia, lung, placenta, head, and neck, and vaginal.

[d] BMI: Body Mass Index. BMI was calculated as self-reported weight in kilograms divided by height in meters squared. Underweight/Normal: BMI <18.5 -24.9; Overweight: 25- 29.9; Obese: BMI <= 30

[e] Race category ‘‘other’’ includes Asian, American Indian, Alaskan Native, Native Hawaiian, and Pacific Islander

95% CI, 95% Confidence Interval; OR, odds ratio; aOR, adjusted odds ratio