

# Black Women's Health Study Publications

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## 2018

Uribe-Salazar JM, Palmer JR, Haddad SA, Rosenberg L, Ruiz-Narváez EA. Admixture mapping and fine-mapping of type 2 diabetes susceptibility loci in African American women. *J Hum Genet* 2018;63(11):1109-17. doi: 10.1038/s10038-018-0503-2.

African American women are disproportionately affected by type 2 diabetes. Genetic factors may explain part of the excess risk. In this detailed analysis of genetic data from BWHS participants with and without type 2 diabetes, African ancestry was associated with greater risk of type 2 diabetes. Some of the genetic variants previously identified in studies of White populations were associated with increased risk in the BWHS. In addition, two new genomic regions associated with risk of type 2 diabetes were identified. Our results indicate that many genetic risk variants for type 2 diabetes are shared across ancestries.

Petrick JL, ..., Rosenberg L, ..., Palmer JR, et al. Body mass index, diabetes and intrahepatic cholangiocarcinoma risk: the Liver Cancer Pooling Project and meta-analysis. *Am J Gastroenterol* 2018;113(10):1494-505. doi: 10.1038/s41395-018-0207-4.

Obesity and diabetes are associated with an increased risk of the most common type of liver cancer, hepatocellular carcinoma (HCC). Few studies have examined obesity and diabetes in relation to the second most common type of liver cancer, intrahepatic cholangiocarcinoma (ICC). In a collaborative analysis of data from multiple studies, including the BWHS, obesity and diabetes were associated with an increased risk of ICC, similar to the associations of these factors with HCC.

Yao S, ... Rosenberg L, Palmer JR, ... et al. Genetic ancestry and population differences in levels of inflammatory cytokines in women: role for evolutionary selection and environmental factors. *PLoS Genet* 2018;14(6):e1007368. doi: 10.1371/journal.pgen.1007368.

Selection pressure due to exposure to infectious pathogens endemic to Africa may explain distinct genetic variations in immune response genes between racial groups. There are few data on population differences in constitutional immune environment, where genetic ancestry and environment are likely two primary sources of variation. In a study integrating genetic, molecular and epidemiologic data based on the AMBER consortium in which BWHS participates, population differences in plasma levels of 14 cytokines involved in innate and adaptive immunity, including those implicated in chronic inflammation, were examined, together with possible contributing factors to such differences among African American women and women of European ancestry. The results showed a strong ancestral impact in inflammation pathways, and suggest that immune differences due to ancestry may contribute to health disparities between African American and European American populations.

Denis GV, Sebastiani P, Bertrand KA, Strissel KJ, Tran AH, Slama J, Medina ND, Andrieu G, Palmer JR. Inflammatory signatures distinguish metabolic health in African American women with obesity. *PLoS ONE* 2018;13(5):e0196755. doi: 10.1371/journal.pone.0196755.

Type 2 diabetes (T2D) associated with obesity is an inflammatory condition that increases risk of heart disease and other conditions. We examined blood-based cytokines to develop inflammation scores for three groups of women within the BWHS: obese women with T2D and hypertension, obese women without T2D or hypertension, and lean women without T2D or hypertension. Inflammation profiles differed, with those of obese women without T2D or hypertension somewhat similar to those of lean women without T2D or hypertension. These analyses suggest that blood-based cytokine profiles are a useful way to discern inflammation and T2D risk among women with obesity, and would be a useful addition to personalized risk assessment.

Schoemaker MJ, ..., Bertrand KA, ..., Palmer JR, et al. Association of body mass index and age with subsequent breast cancer risk in premenopausal women. *JAMA Oncol* 2018;4(11):e181771. doi: 10.1001/jamaoncol.2018.1771.

Body mass index (BMI), a measure of weight for a given height, has a unique relationship with breast cancer risk, with higher BMI associated with lower risk of breast cancer in premenopausal women but a higher risk of breast cancer in postmenopausal women. In a collaborative study of data from 19 follow-up studies, including the BWHS, BMI was assessed in relation to risk of premenopausal breast cancer. The results confirmed the results of previous studies, and found the strongest effects in early adulthood. The association of BMI with risk was stronger for estrogen receptor positive breast cancer than for estrogen receptor negative breast cancer. Understanding the biology of this effect could lead to new approaches to preventing breast cancer.

Bensen JT, ..., Rosenberg L, ..., Palmer JR, et al. A survey of microRNA single nucleotide polymorphisms identifies novel breast cancer susceptibility loci in a case-control, population-based study of African-American women. *Breast Cancer Res* 2018;20(1):45. doi: 10.1186/s13058-018-0964-4.

MicroRNAs (miRNAs) regulate gene expression and influence cancer. Since little is known about the role of germline variation in miRNA genes and breast cancer, we sought to identify variants associated with breast cancer risk in African-American women in the AMBER Consortium, of which BWHS is one of four member studies. Genetic analysis identified a miRNA gene (MIR3065) that displayed a statistically significant breast cancer signal and may play an important role in breast cancer development among African American women. This relationship needs further study.

Griswold MK, Crawford SL, Perry DJ, Person SD, Rosenberg L, Cozier YC, Palmer JR. Experiences of racism and breastfeeding initiation and duration among first-time mothers of the Black Women's Health Study. *J Racial Ethn Health Disparities* 2018;5(6):1180-91. doi: 10.1007/s40615-018-0465-2.

Black women are less likely to breastfeed than other groups in the U.S. We analyzed BWHS data to explore whether neighborhood segregation, birthplace (first or second generation US born vs foreign-born) and experiences of racism influenced breastfeeding initiation and duration. We found that BWHS participants born in the US were less likely to breastfeed, or they breastfed for a shorter time. The same was true for women who grew up in a predominantly Black neighborhood compared to those who grew up in a predominantly White neighborhood. Experience of racism on the job was associated with a shorter duration of breastfeeding. These results indicate that structural-level interventions are needed to lessen racial disparities in breastfeeding rates in the U.S.

Allott EH, ... Bethea TN, ... Palmer JR, et al. Frequency of breast cancer subtypes among African American women in the AMBER consortium. *Breast Cancer Res* 2018;20(1):12. doi: 10.1186/s13058-018-0939-5.

Breast cancer subtype can be classified using standard clinical markers (estrogen receptor (ER), progesterone receptor (PR) and human epidermal growth factor receptor 2 (HER2)) from medical records, supplemented with additional markers. The aim of this study was to optimize tumor classification using automated methods in order to describe subtype frequency in the AMBER consortium of studies of breast cancer in African American women. Our findings indicate that automated immunohistochemistry-based classification produces tumor subtype frequencies approximating those from PAM50-based classification. We found a high frequency of basal-like breast cancer and a low frequency of luminal A breast cancer in the AMBER consortium relative to frequencies among white women.

Haddad SA, Ruiz-Narváez EA, Cozier YC, Gerlovin H, Rosenberg L, Palmer JR. Association of degree of European genetic ancestry with serum vitamin D levels in African Americans. *Am J Epidemiol* 2018;187(7):1420-3. doi: 10.1093/aje/kwy015.

Vitamin D levels are generally lower in African Americans than in White Americans, and that difference may be related to genetic components of ancestry. In this analysis, based on genotyping of blood samples from BWHS participants, women who were not taking vitamin D supplements and had a higher percentage of European ancestry had higher levels of vitamin D. There was no association of vitamin D level with percent European ancestry among women who were taking vitamin D supplements. These results suggest that differences in vitamin D levels can be explained, in part, by genetic ancestry and also suggest that deficiencies related to ancestry may be resolved by use of vitamin D supplements.

Petrick JL, ..., Palmer JR, ..., Rosenberg L, et al. Tobacco, alcohol use and risk of hepatocellular carcinoma and intrahepatic cholangiocarcinoma: The Liver Cancer Pooling Project. *Br J Cancer* 2018;118(7):1005-12. doi: 10.1038/s41416-018-0007-z.

In this collaborative study of 14 U.S.-based follow-up studies including the BWHS, we examined risk of two different types of liver cancer, hepatocellular carcinoma (HCC) and intrahepatic cholangiocarcinoma (ICC), in relation to smoking and alcohol use. Current

smoking and heavy alcohol consumption was related to an increased risk of HCC and ICC. Among individuals who quit smoking more than 30 years ago, HCC risk was almost equivalent to that of individuals who had never smoked. Light-to-moderate alcohol consumption (<3 drinks per day) was related to a decreased risk of HCC, but not ICC. These findings suggest that smoking cessation and light-to-moderate drinking may reduce the risk of liver cancer.

Cozier YC, Yu J, Wise LA, VanderWeele TJ, Balboni TA, Argentieri MA, Rosenberg L, Palmer JR, Shields A. Religious and spiritual coping and risk of incident hypertension in the Black Women's Health Study. *Ann Behav Med* 2018;52(12):989-98. doi: 10.1093/abm/kay001.

Stress has been linked to increased risk of hypertension (high blood pressure). We assessed data from the BWHS to examine the hypothesis that religious and/or spiritual coping could reduce the risk of developing hypertension by reducing stress. Responses to questions regarding spiritual and religious practices and coping, collected in 2005, were analyzed in relation to newly diagnosed hypertension that occurred after 2005. Religious/spiritual coping was associated with decreased risk of hypertension, with a stronger association among women who reported more stress. However, more frequent prayer was associated with increased risk of hypertension. More research is needed to understand these associations and to determine how religious/spiritual practices and coping may affect health.

Hong CC, ..., Rosenberg L, ..., Palmer JR, et al. Genetic variants in immune-related pathways and breast cancer risk in African American women in the AMBER consortium. *Cancer Epidemiol Biomarkers Prev* 2018;27(3):321-30. doi: 10.1158/1055-9965.EPI-17-0434

It has been proposed that immunity shaped by exposure to infectious diseases in sub-Saharan Africa may play a role in the development of breast cancer in African American women. In a collaborative study (the AMBER consortium) that includes the BWHS, genetic variants in several immune pathways were associated with risk of ER+ and ER- breast cancer, with more associations for ER- cancer. The findings support the hypothesis that inherited genetic variation in immune pathways, which result in part from exposure to endemic infectious diseases and parasites common in sub-Saharan Africa, is a factor in breast cancer susceptibility in African American women.

Sponholtz TR, Wise LA, Hatch EE, Palmer JR, Rosenberg L, Adams-Campbell LL. Exogenous hormone use and endometrial cancer in U.S. black women. *Cancer Epidemiol Biomarkers Prev* 2018;27(5):558-65. doi: 10.1158/1055-9965.EPI-17-0722.

Previous studies, primarily of White women, have found lower endometrial cancer risk among women who use oral contraceptives and higher risk among women who use estrogen-only female hormone supplements. We examined these associations within the BWHS. Based on 300 endometrial cancer cases that developed during follow-up, we found that BWHS participants who had used oral contraceptives for at least 10 years had a lower risk of endometrial cancer, and those who currently used estrogen-only female hormone supplements had a higher risk, consistent with results among White women.

## 2017

Palmer JR, Castro-Webb N, Bertrand K, Bethea TN, Denis GV. Type 2 diabetes and incidence of estrogen receptor negative breast cancer in African American women. *Cancer Res* 2017;77(22):6462-9. doi: 10.1158/0008-5472.CAN-17-1903.

Type 2 diabetes has been associated with increased risk of developing breast cancer among white women. While type 2 diabetes occurs much more commonly among Black women, little is known about its relation to breast cancer incidence among Black women. In the BWHS, we found that type 2 diabetes was not associated with the risk of estrogen receptor-positive (ER+) breast cancer, whereas risk of estrogen receptor-negative (ER-) breast cancer was 40% greater among women with type 2 diabetes than among unaffected women. The high prevalence of type 2 diabetes in Black women could be contributing to the higher incidence of ER- breast cancer, an aggressive subtype, relative to that in other population groups.

Chollet-Hinton L, Olshan AF, Nichols HB, Anders CK, Lund JL, Allott EH, Bethea TN, Hong CC, Cohen SM, Khoury T, Zirpoli GR, Borges VF, Rosenberg L, Bandera EV, Ambrosone CB, Palmer JR, Troester MA. Biology and etiology of young-onset breast cancers among premenopausal African American women: results from the AMBER Consortium. *Cancer Epidemiol Biomarkers Prev* 2017;26(12):1722-9. doi: 10.1158/1055-9965.EPI-17-0450.

African American women have a higher incidence of aggressive breast cancer at younger ages. Using data from the AMBER Consortium, a consortium of studies of breast cancer in African American (AA) women that includes the BWHS, we examined tumor characteristics and breast cancer risk factors associated with breast cancer occurring among premenopausal women at ages <40 and 40 or older. Women <40 years old had a higher frequency of poorer-prognosis tumors compared with older women. Waist-to-hip ratio and family history of breast cancer were more strongly associated with younger-onset disease, and breastfeeding appeared protective among younger women. Oral contraceptive use was associated with increased risk regardless of age. Based on these results, it may be possible to reduce breast cancer in young women by modifying waist-to-hip ratio, oral contraceptive use, and breastfeeding.

Bertrand KA, Gerlovin H, Bethea TN, Palmer JR. Pubertal growth and adult height in relation to breast cancer risk in African American women. *Int J Cancer* 2017;141(12):2462-70. doi: 10.1002/ijc.31019.

We assessed the contributions of height, the age at which maximum height is reached, and age at menarche (start of menstruation) to the risk of the major subtypes of breast cancer, estrogen receptor-positive (ER+) and estrogen receptor-negative (ER-). Height was associated with higher risk of ER+ cancer, and early age at attained height with and early age at menarche with increased risk of both ER+ and ER- cancer. These findings give clues as to how and when risk of breast cancer is established.

Bacon KL, Stuver SO, Cozier YC, Palmer JR, Rosenberg L, Ruiz-Narváez EA. Perceived racism and incident diabetes in the Black Women's Health Study. *Diabetologia* 2017;60(11):2221-5. doi: 10.1007/s00125-017-4400-6.

BWHS participants have been asked questions about experience with interpersonal racism in daily life (everyday racism) and lifetime racism with respect to police, housing, and work. We assessed racism in relation to type 2 diabetes from 1995 through 2011 in the BWHS, during which time 5,344 women were diagnosed with diabetes. Both everyday and lifetime racism were associated with increased risk of developing type 2 diabetes. Increased weight associated with racism accounted for about half of the increase in risk.

Nichols HB, ..., Bertrand KA, ..., Palmer JR, et al. The Premenopausal Breast Cancer Collaboration: a pooling project of studies participating in the National Cancer Institute Cohort Consortium. *Cancer Epidemiol Biomarkers Prev* 2017;26(9):1360-9. doi: 10.1158/1055-9965.EPI-17-0246.

The incidence of advanced breast cancer among premenopausal women has increased in recent decades, although it is still relatively rare compared to incidence among postmenopausal women. In order to have a large enough sample size for informative study of premenopausal breast cancer, many studies must band together. The Premenopausal Breast Cancer Collaborative Group has just been formed with the purpose of studying specific subtypes of premenopausal breast cancer, and the BWHS will be a key contributor to this effort.

Jordan SJ, ..., Palmer JR, et al. Breastfeeding and endometrial cancer risk: an analysis from the Epidemiology of Endometrial Cancer Consortium. *Obstet Gynecol* 2017;129(6):1059-67. doi: 10.1097/AOG.0000000000002057.

The association between breast feeding and risk of endometrial cancer was assessed in data from 17 studies participating in the Epidemiology of Endometrial Cancer Consortium. The analyses included 8,981 women with endometrial cancer and 17,241 women in a control group. Ever breastfeeding was associated with an 11% reduction in risk of endometrial cancer. Longer average duration of breastfeeding per child was associated with lower risk of endometrial cancer, although there appeared to be some leveling of this effect beyond 6-9 months. Our findings suggest that reducing endometrial cancer risk can be added to the list of maternal benefits associated with breastfeeding.

Feng Y, ... Palmer JR, et al. Characterizing genetic susceptibility to breast cancer in women of African ancestry. *Cancer Epidemiol Biomarkers Prev* 2017;26(7):1016-26. doi: 10.1158/1055-9965.EPI-16-0567.

Genome-wide association studies have identified approximately 100 common genetic variants associated with breast cancer risk, mostly among white women. 74 breast cancer risk variants and genetic variants in associated regions were assessed in 6,522 breast cancer cases and 7,643 controls of African ancestry from three large consortial studies.

We found confirmatory evidence for 73% of the 74 variants. Other variants in the regions that were better risk markers for breast cancer were also found. Thus, we have identified genetic variants that better characterize breast cancer risk in women of African ancestry.

Wang H, ..., Palmer JR, et al. Novel colon cancer susceptibility variants identified from a genome-wide association study in African Americans. *Int J Cancer* 2017;140(12):2728-33.

In a collaborative study, genetic variants across the genome were assessed in relation to colorectal cancer in African Americans (AA). A novel genetic variant associated with risk in AAs was identified, as well as another variant that had a stronger association in AAs than in other ethnic groups.

Sponholtz TR, Palmer JR, Rosenberg L, Hatch EE, Adams-Campbell LL, Wise LA. Reproductive factors and incidence of endometrial cancer in U.S. black women. *Cancer Causes Control* 2017;28(6):579-88. doi: 10.1007/s10552-017-0880-4.

We studied the relation of reproductive factors to incidence of endometrial cancer in the BWHS, based on 300 women who were affected by the condition during 18 years of follow-up. Earlier age at start of menstruation was associated with higher risk and later age at first birth with lower risk. Women who had had children were at lower risk than those who had not had children. These results suggest that these factors have similar associations with endometrial cancer in black and white women.

Yao S, ..., Rosenberg L, Palmer JR, et al. Demographic, lifestyle, and genetic determinants of circulating concentrations of 25-hydroxyvitamin D and vitamin D-binding protein in African American and European American women. *Am J Clin Nutr* 2017;105(6):1362-71. doi: 10.3945/ajcn.116.143248.

Vitamin D levels differ between African American (AA) and European Americans (EA), with many more AAs being vitamin D deficient. Vitamin D deficiency may be related to incidence of several illnesses. Levels of vitamin D (i.e., 25(OH)D) and of vitamin D-binding protein (VDBP) in AA and EA women were compared. AA women had lower levels of vitamin D but similar levels of VDBP as EA women. Demographic and lifestyle determinants of vitamin D were similar in the two populations, but genetic determinants may be ethnicity specific.

Haddad SA, Palmer JR, Lunetta KL, Ng MCY, the MEDIA Consortium, Ruiz-Narváez EA. A novel TCF7L2 type 2 diabetes SNP identified from fine mapping in African American women. *PLoS ONE* 2017;12(3):e0172577. doi: 10.1371/journal.pone.0172577.

In genetic studies, some genes in the Wnt pathway have been found to be associated with type 2 diabetes. Other genes in the pathway were assessed in a collaborative study of African Americans. A new variant that may represent a signal seen only in African ancestry populations was identified. The finding needs to be replicated.

Williams LA, Olshan AF, Hong CC, Bandera EV, Rosenberg L, Cheng TYD, Lunetta KL, McCann SE, Poole C, Kolonel LN, Palmer JR, Ambrosone CB, Troester MA. Alcohol intake and breast cancer risk in African American women from the AMBER Consortium. *Cancer Epidemiol Biomarkers Prev* 2017;26(5):787-94. doi: 10.1158/1055-9965.EPI-16-0792.

Numerous studies have linked heavy alcohol consumption to an increase in breast cancer incidence. In a study of data from the BWHS and three other studies of African American women, consumption of at least seven drinks per week was associated with a small increase in risk of breast cancer in the overall data. However, the results among the four studies were not consistent.

Heaton B, Gordon NB, Garcia RI, Rosenberg L, Rich S, Fox MP, Cozier YC. A clinical validation of self-reported periodontitis among participants in the Black Women's Health Study. *J Periodontol* 2017;88(6):582-92. doi: 10.1902/jop.2017.160678.

Periodontitis (infections of the gums and bone) occur commonly. To study risk factors for periodontitis and effects of periodontitis on health requires adequate reporting of the condition. BWHS participants living in Massachusetts in the Boston metropolitan area were invited to participate in a study of the validity of reporting of dental conditions, which involved having a clinical examination by a dentist. A total of 77 BWHS participants were examined for periodontal disease, and their questionnaire responses about dental disease were compared with the clinical data. Accuracy of reporting was similar to that in other populations, and it was sufficient for studies of periodontitis in the BWHS based on self-report.

Charlot M, Castro-Webb N, Bethea TN, Bertrand K, Boggs DA, Denis GV, Adams-Campbell LL, Rosenberg L, Palmer JR. Diabetes and breast cancer mortality in black women. *Cancer Causes Control* 2017;28(1):61-7. doi: 10.1007/s10552-016-0837-z.

Both mortality from breast cancer and the occurrence of diabetes are higher in black women than white women. We assessed whether diabetes may be contributing to mortality among breast cancer survivors in the BWHS. Based on over 1,600 participants who had been diagnosed with breast cancer, we found that breast cancer mortality was increased among those who had been diagnosed with diabetes at least 5 years before breast cancer occurrence. The increase was present for both estrogen receptor positive and estrogen receptor negative breast cancer. The results suggest that diabetes contributes to breast cancer mortality among women with breast cancer.

Bethea TN, Palmer JR, Adams-Campbell LL, Rosenberg L. A prospective study of reproductive factors and exogenous hormone use in relation to ovarian cancer risk among black women. *Cancer Causes Control* 2017;28(5):385-91. doi: 10.1007/s10552-016-0840-4.

Extensive evidence in white women has linked oral contraceptive use, tubal ligation (tubes tied), and higher parity (greater number of children) with reduced risk of ovarian cancer. Results on supplemental female hormones used for the menopause are inconsistent. We studied these factors in the BWHS. The associations of oral



contraceptive use, tubal ligation, and parity with ovarian cancer in the BWHS were similar to those in white women. The results suggested that use of female hormone supplements may be associated with increased risk, but more studies are needed to be certain.

Jerrett M, Brook RD, Burnett RT, White LF, Yu J, Su J, Seto E, Marshall J, Palmer JR, Rosenberg L, Coogan PF. Ambient ozone and incident diabetes: a prospective analysis in a large cohort of African American women. *Environ Int* 2017;102:42-7. doi: 10.1016/j.envint.2016.12.011.

Ozone is a commonly occurring air pollutant. Because ozone can lead to insulin resistance, we studied the relation of ozone levels to incidence of type 2 diabetes in the BWHS. We found evidence of increases in diabetes risk associated with higher ozone levels. While other factors, such as obesity, have a much stronger relationship with diabetes, this first evidence on a possible association of ozone with the occurrence of diabetes supports the need for continuing research on potential adverse effects of air pollution.

Coogan PF, White LF, Yu J, Brook RD, Burnett RT, Marshall JD, Bethea TN, Rosenberg L, Jerrett M. Long-term exposure to NO<sub>2</sub> and ozone and hypertension incidence in the Black Women's Health Study. *Am J Hypertens* 2017;30(4):367-72. doi: 10.1093/ajh/hpw168.

Air pollutants can increase blood pressure. We studied levels of traffic-related nitrogen dioxide (NO<sub>2</sub>) and of ozone in relation to the incidence of hypertension in the BWHS. Over a period of 16 years, 9,570 new cases of hypertension were identified. Higher ozone levels were associated with increased risk of hypertension, but higher NO<sub>2</sub> levels were associated with decreased risk.

Murphy ME, ..., Lunetta KL, Palmer JR, Ambrosone CB. A functionally significant SNP in TP53 and breast cancer risk in African American women. *NPJ Breast Cancer* 2017;3(5). doi: 10.1038/s41523-017-0007-9.

A polymorphism in the TP53 gene and has been shown to reduce tumor suppression in mice. To explore whether this polymorphism affects cancer risk in people of African descent, we analyzed genetic data from 6,907 women with breast cancer and 7,644 women without cancer from the AMBER, ROOT, and AABC consortia. We found no evidence of an association with breast cancer among all participants, but there was increased risk among premenopausal women. More studies of this genetic variant in human populations are needed. However, the frequency of this polymorphism is low in women of African ancestry, so its impact on the population level may be minimal.

Zhu Q, Shepherd L, Lunetta KL, Yao S, Liu Q, Hu Q, Haddad SA, Sucheston-Campbell L, Bensen JT, Bandera EV, Rosenberg L, Liu S, Haiman CA, Olshan AF, Palmer JR, Ambrosone CB. Trans-ethnic follow-up of breast cancer GWAS hits using the preferential linkage disequilibrium approach. *Oncotarget* 2017;7(50):83160-76. doi: 10.18632/oncotarget.13075.

Genetic studies often identify multiple genetic variants associated with a particular outcome, and methods are needed to help identify real causal variants from among chance findings. A method called the preferential LD approach was tested in genetic data derived in four studies of breast cancer in African American women, including the BWHS. The results support the use of the preferential LD approach in African American women.

Chetwynd EM, Stuebe AM, Rosenberg L, Troester M, Rowley D, Palmer JR. Cumulative lactation and onset of hypertension in African American women. *Am J Epidemiol* 2017;186(8):927-34. doi: 10.1093/aje/kwx163.

Hypertension (high blood pressure) affects Black women more than other racial groups, and it increases the risk of heart disease, which is the leading cause of death in the U.S. In a study of breastfeeding and hypertension in the BWHS, we found that breastfeeding was associated with a reduced risk of hypertension at ages 40-49 years. Risk decreased as duration of breastfeeding increased. If confirmed, this adds to the list of reasons that it is good for the health of women (as well as their babies) for them to breastfeed.

Bertrand KA, Bethea TN, Adams-Campbell LL, Rosenberg L, Palmer JR. Differential patterns of risk factors for early-onset breast cancer by ER status in African American women. *Cancer Epidemiol Biomarkers Prev* 2017;26(2):270-7. doi: 10.1158/1055-9965.EPI-16-0692.

Aggressive subtypes of breast cancer, such as estrogen receptor negative (ER-) tumors, lead to higher breast cancer mortality and occur more commonly among Black women than among White women. Risk factors for ER- breast cancer are poorly understood. We assessed reproductive risk factors and body size in relation to the incidence of ER- and ER+ breast cancer in the BWHS. Higher parity (number of births) and older age at first birth were associated with increased risk of ER- breast cancer among women less than 45 years of age; breastfeeding reduced the risk associated with higher parity. Abdominal obesity (obesity around the waist as opposed to around the hips) was also associated with higher risk of ER- breast cancer among women under age 45. None of these factors was associated with ER+ breast cancer at older ages or with ER+ breast cancer. These findings indicate that risk factors vary by age and by breast cancer subtype, and that differences in reproductive factors may contribute to Black/White differences in the occurrence of aggressive forms of breast cancer.

## 2016

Campbell PT, ..., Petrick JL, ..., Rosenberg L, et al. Body mass index, waist circumference, diabetes, and risk of liver cancer for U.S. adults. *Cancer Res* 2016;76(20):6076-83. doi: 10.1158/0008-5472.CAN-16-0787.

Incidence rates for liver cancer have increased 3-fold since the mid-1970s in the United States in parallel with increasing trends for obesity and type II diabetes mellitus. In a collaborative project, the Liver Cancer Pooling Project, data from 1.57 million adults enrolled in 14 U.S.-based prospective studies, including the BWHS, were analyzed.

Higher body mass index was associated with higher risk of liver cancer except among people who were sera-positive for hepatitis. Higher waist to hip ratio and history of type II diabetes were also associated with higher risk of liver cancer. These results suggests that the increasing trends for obesity and type 2 diabetes in the US are contributing to the increase in liver cancer incidence.

Shields AE, Wise LA, Ruiz-Narváez EA, Seddighzadeh B, Byun HM, Cozier YC, Rosenberg L, Palmer JR, Baccarelli AA. Childhood abuse, promoter methylation of leukocyte NR3C1 and the potential modifying effect of emotional support. *Epigenomics* 2016;8(11):1507-17. doi: 10.2217/epi-2016-0074.

Traumatic events, such as childhood abuse, may result in changes in how genes are expressed. Using blood samples collected from BWHS participants, we assessed DNA methylation levels in a particular genetic region that has been linked to psychosocial stressors in other studies. We found that methylation levels were greater in women who reported childhood abuse than in women who reported no abuse. It was unclear whether childhood emotional support modified this association and resulted in less methylation. Further studies are needed to clarify that issue.

Jerrett M, Turner MC, Beckerman BS, Pope CA 3rd, van Donkelaar A, Martin RV, Serre M, Crouse D, Gapstur SM, Krewski D, Diver WR, Coogan PF, Thurston GD, Burnett RT. Comparing the health effects of ambient particulate matter estimated using ground-based versus remote sensing exposure estimates. *Environ Health Perspect* 2017;125(4):552-9. doi: 10.1289/EHP575.

Air pollution levels can be measured with remote sensing devices or using ground-based information. Both measures were associated with mortality in a large study of cancer, but the effect estimates were generally larger when the ground-based information was used.

Ruiz-Narváez EA, Sucheston-Campbell L, Bensen JT, Yao S, Haddad S, Haiman CA, Bandera EV, John EM, Bernstein L, Hu JJ, Ziegler RG, Deming SL, Olshan AF, Ambrosone CB, Palmer JR, Lunetta KL. Admixture mapping of African-American women in the AMBER Consortium identifies new loci for breast cancer and estrogen-receptor subtypes. *Front Genet* 2016;7:170. doi: 10.3389/fgene.2016.00170.

We carried out the largest study to date in African American women focused on identifying new genomic regions associated with African ancestry that may be associated with risk of breast cancer. We used data from the BWHS and a collaborative study of breast cancer in Black women, the AMBER collaboration, in which the BWHS participates. We found two new regions of excess African ancestry that were associated with estrogen receptor-positive breast cancer and also confirmed two other regions identified previously. The results indicate that previously unidentified genetic variants may contribute to Black/White differences in breast cancer risk.

Ruiz-Narváez EA, Lunetta KL, Hong CC, Haddad S, Yao S, Cheng TYD, Bensen JT, Bandera EV, Haiman CA, Troester MA, Ambrosone CB, Rosenberg L, Palmer JR. Genetic variation in the insulin, insulin-like growth factor, growth hormone, and leptin pathways in relation to breast cancer in African American women: the AMBER consortium. *NPJ Breast Cancer* 2016;2. doi: 10.1038/npjbcancer.2016.34.

The BWHS participated, together with three other studies of African American (AA) women, in a study that included 1,938 women with estrogen receptor positive (ER+) breast cancer, 1,098 with ER negative (ER-) breast cancer, and 4,687 women without breast cancer. ER- breast cancer is an aggressive breast cancer subtype that occurs more commonly in African American women. The purpose was to determine whether genetic variants in the insulin/insulin-like growth factor (IGF) system are related to the risk of developing specific types of breast cancer, especially ER-. This pathway has been shown to have a key role in cancer development. We identified several genetic variants related specifically to risk of ER- breast cancer.

Nomura SJO, Dash C, Rosenberg L, Yu J, Palmer JR, Adams-Campbell LL. Adherence to diet, physical activity and body weight recommendations and breast cancer incidence in the Black Women's Health Study. *Int J Cancer* 2016;139(12):2738-52. doi: 10.1002/ijc.30410.

Adherence to cancer prevention recommendations may contribute to lower incidence of breast cancer, but evidence in Black women is limited. We assessed whether BWHS participants who followed recommendations from the World Cancer Research Fund/American Institute for Cancer Research (WCRF/AICR) had lower breast cancer incidence. In analyses that took into account changes in habits over time, we found that following recommendations to exercise and to limit alcohol, sugary beverage, and red and processed meat consumption were associated with reduced risk. However, relatively few women followed the WCRF/AICR recommendations.

Gong Z, Hong CC, Bandera EV, Adams-Campbell LL, Troester MA, Park SY, McInerney KA, Zirpoli G, Olshan AF, Palmer JR, Ambrosone CB, Rosenberg L. Vigorous physical activity and risk of breast cancer in the African American Breast Cancer Epidemiology and Risk Consortium. *Breast Cancer Res Treat* 2016;159(2):347-56. doi: 10.1007/s10549-016-3936-3.

Evidence from studies of white women has suggested that physical activity may reduce the risk of developing breast cancer. In a previous study in the BWHS, vigorous exercise was associated with lower risk of breast cancer. In the present analysis based on data in the African American Breast Cancer Epidemiology and Risk Consortium of four large studies of African American women, in which the BWHS is participating, recent vigorous exercise was associated with reduced risk of estrogen receptor positive breast cancer.

Huo D, ..., Ruiz-Narváez EA, ..., Lunetta KL, ..., Palmer JR, Haiman CA. Genome-wide association studies in women of African ancestry identified 3q26.21 as a novel susceptibility locus for estrogen receptor negative breast cancer. *Hum Mol Genet* 2016;25(21):4835-46. doi: 10.1093/hmg/ddw305.

Most studies of genes involved in the occurrence of breast cancer have been conducted in women of European ancestry (white women). We used genetic data from several studies of women of African ancestry to identify genetic variants associated with breast cancer in this population group. Several genetic variants associated with estrogen receptor negative breast cancer and estrogen receptor positive breast cancer were identified. These genetic variants may be useful in building effective breast cancer risk prediction models for African American women.

Palmer JR, Gerlovin H, Bethea TN, Bertrand KA, Holick MF, Ruiz-Narváez EA, Wise LA, Haddad SA, Adams-Campbell LL, Kaufman HW, Rosenberg L, Cozier YC. Predicted 25-hydroxyvitamin D in relation to incidence of breast cancer in a large cohort of African American women. *Breast Cancer Res* 2016;18(1):86. doi: 10.1186/s13058-016-0745-x.

Vitamin D deficiency, which has been linked to an increased risk of colorectal cancer, is common among African Americans. Studies of vitamin D deficiency and breast cancer risk, conducted mostly in white women, have been conflicting. To study the relation of vitamin D levels to breast cancer risk in the BWHS, we first developed a vitamin D prediction model. The model was based on comparing measured levels of vitamin D (specifically, 25-hydroxyvitamin D) in blood samples provided by BWHS participants with levels predicted by models based on participants' vitamin D consumption in the diet and from supplements, weight, cigarette smoking, and several other factors. The model was then used to predict vitamin D levels among all women in the BWHS. Using the predicted levels of vitamin D together with information on breast cancer occurrences, we estimated that women with the lowest levels of vitamin D had an increased risk of breast cancer compared with women with higher levels. These results suggest that treating vitamin D deficiency could result in lower risk of breast cancer.

Zhang J, Yao S, Hu Q, Zhu Q, Liu S, Lunetta KL, Haddad SA, Yang N, Shen H, Hong CC, Sucheston-Campbell L, Ruiz-Narváez EA, Bensen JT, Troester MA, Bandera EV, Rosenberg L, Haiman CA, Olshan AF, Palmer JR, Ambrosone CB. Genetic variations in the Hippo signaling pathway and breast cancer risk in African American women in the AMBER Consortium. *Carcinogenesis* 2016;37(10):951-6. doi: 10.1093/carcin/bgw077.

A signaling pathway in the body, called HIPPO, regulates cell growth and survival. Based on genotyping data in the African American Breast Cancer Epidemiology and Risk Consortium of studies of African American women, in which the BWHS is participating, we found that the several genetic variants in the Hippo signaling pathway were significantly associated with estrogen-receptor negative and estrogen receptor positive breast cancer.

Petrick JL, ..., Palmer JR, et al. Coffee consumption and risk of hepatocellular carcinoma and intrahepatic cholangiocarcinoma by sex: The Liver Cancer Pooling Project. *Cancer Epidemiol Biomarkers Prev* 2015;24(9):1398-406. doi: 10.1158/1055-9965.EPI-15-0137.

Coffee consumption has been reported to be inversely associated with hepatocellular carcinoma (HCC), the most common type of liver cancer. There have been no studies of

coffee and intrahepatic cholangiocarcinoma (ICC), the second most common type of liver cancer. In the Liver Cancer Pooling Project, a consortium of U.S.-based cohort studies, including the BWHS, data from 1,212,893 individuals, including 860 with HCC and 260 with ICC, were assessed. Consumption of more than 3 cups of coffee per day, relative to nondrinking, was associated with a 27% lower risk of HCC. The risk reduction was greater in women than in men. The associations were stronger for caffeinated coffee than decaffeinated coffee. There was no association between coffee consumption and ICC. These findings suggest that coffee consumption in the U.S. is associated with reduced risk of HCC.

Petrick JL, ...Palmer JR, Rosenberg L, et al. NSAID use and risk of hepatocellular carcinoma and intrahepatic cholangiocarcinoma: The Liver Cancer Pooling Project. *Cancer Prev Res Phila Pa* 2015;8(12):1156-62. doi: 10.1158/1940-6207.CAPR-15-0126.

Experimental studies have suggested that nonsteroidal anti-inflammatory drugs (NSAIDs), including aspirin and ibuprofen, may potentially protect against liver cancer. As part of the Liver Cancer Pooling Project, we assessed data on 1,084,133 individuals (including 679 with hepatocellular carcinoma (HCC) and 225 with intrahepatic cholangiocarcinoma (ICC) from 10 U.S.-based cohort studies, including BWHS. Current aspirin use, versus nonuse, was with a 32% lower risk of HCC; the association was stronger for users who reported daily use, longer duration use, and lower dosage. Ibuprofen use was not associated with HCC risk. Aspirin use was associated with a reduced ICC risk in men but not women.

McGlynn KA, ..., Palmer JR, et al. Reproductive factors, exogenous hormone use and risk of hepatocellular carcinoma among US women: results from the Liver Cancer Pooling Project. *Br J Cancer* 2015;112 Suppl:1266-72.

Hepatocellular carcinoma (HCC) occurs less commonly among women than men in almost all regions of the world. The disparity in risk is particularly notable prior to menopause suggesting that hormonal exposures during reproductive life may be protective. In the Liver Cancer Pooling Project, a consortium of US-based cohort studies, data from 799,500 women in 11 cohorts, including BWHS, were assessed. Bilateral oophorectomy (removal of both ovaries) was associated with a significantly increased risk of HCC. There was no association of oral contraceptives use, parity, age at first birth, age at natural menopause, or duration of fertility with HCC. These findings do not help to explain the female/male disparity in HCC incidence.

Nomura SJO, Dash C, Rosenberg L, Palmer JR, Adams-Campbell LL. Sedentary time and breast cancer incidence in African American women. *Cancer Causes Control* 2016;27(10):1239-52. doi: 10.1007/s10552-016-0803-9.

Evidence has been growing that sedentary behavior, such as long hours of sitting, increases the risk of several illnesses, independent of physical activity. We evaluated whether time spent sitting at work or time spent watching television, or both combined, was associated with breast cancer risk in the BWHS. We found that higher levels of total

time sitting reported at baseline in 1995, as well as updated total time sitting based on data provided during follow-up, were associated with increased incidence of breast cancer. These associations were present among women who exercised on a regular basis as well as among those who did not exercise. In a previous BWHS study, vigorous exercise was associated with reduced risk of breast cancer. Thus, BWHS findings suggest that high sedentary time may increase risk for breast cancer among Black women, while vigorous exercise may lower risk.

Wise LA, Palmer JR, Rosenberg L, Haddad SA, Ruiz-Narváez EA. FASN, dietary fat intake, and risk of uterine leiomyomata in the Black Women's Health Study. *Fertil Steril* 2016;106(5):1136-41. doi: 10.1016/j.fertnstert.2016.06.019.

In women of European ancestry, an association of a particular gene near the fatty acid synthase (FASN) gene has been found to occur more commonly among women with uterine fibroids. We assessed that possibility in the BWHS. We found no association with risk of fibroids overall. On average, African American women have about 20% European ancestry; we found that among women with higher European ancestry (40% or more), the genetic variant in question was associated with increased risk of fibroids.

Haddad SA, Ruiz-Narváez EA, Haiman CA, Sucheston-Campbell LE, Bensen JT, Zhu Q, Liu S, Yao S, Bandera EV, Rosenberg L, Palmer JR, Olshan AF, Ambrosone CB, Lunetta KL. An exome-wide analysis of low frequency and rare variants in relation to risk of breast cancer in African American women: the AMBER Consortium. *Carcinogenesis* 2016;37(9):870-7. doi: 10.1093/carcin/bgw067.

The influence of genetic background on risk of breast cancer has been studied mainly among European and Asian women. We conducted an analysis of rare genetic variants in relation to risk of breast cancer in the African American Breast Cancer Epidemiology and Risk Consortium, which includes data from four large studies of African American women, including the BWHS. There were no significant associations with overall risk of breast cancer, but a gene not previously identified and a gene previously identified in women of European ancestry were significantly associated with risk of estrogen-receptor negative breast cancer and triple negative breast cancer.

Zanetti KA, ..., Palmer JR, Rosenberg L, Ruiz-Narváez EA, et al. Genome-wide association study confirms lung cancer susceptibility loci on chromosome 5p15 and 15q25 in an African-American population. *Lung Cancer* 2016;98:33-42. doi: 10.1016/j.lungcan.2016.05.008.

Genome-wide association studies (GWAS) of lung cancer have identified regions of genetic variants associated with lung cancer risk in Europeans and Asians. The present study was a GWAS in African Americans, who have higher rates of lung cancer despite smoking fewer cigarettes per day when compared with other population groups. We confirmed results previously reported in African Americans and other populations for two loci near plausible candidate genes that are associated with lung cancer. Additional work is required to map and understand the biological underpinnings of the strong association of these loci with lung cancer risk in African Americans.

VanderWeele TJ, Yu J, Cozier YC, Wise LA, Argentieri MA, Rosenberg L, Palmer JR, Shields AE. Attendance at religious services, prayer, religious coping, and religious/spiritual identity as predictors of all-cause mortality in the Black Women's Health Study. *Am J Epidemiol* 2017;185(7):515-22. doi: 10.1093/aje/kww179.

Previous studies have found that people who attend religious services have a lower mortality rate than non-attenders, but the meaning of this association is unclear. In the BWHS, we assessed mortality in more than 36,000 BWHS participants during eight year period after they had provided information on their religious practices in 2005. Attending religious services several times per week was associated with lower mortality, but engaging in prayer several times per day was associated with higher mortality. Religious coping and self-identification as a religious/spiritual person were not associated with mortality.

Nomura SJO, Dash C, Rosenberg L, Yu J, Palmer JR, Adams-Campbell LL. Is adherence to diet, physical activity and body weight cancer prevention recommendations associated with colorectal cancer incidence in African American women? *Cancer Causes Control* 2016;27(7):869-79. doi: 10.1007/s10552-016-0760-3.

We evaluated whether adherence to the World Cancer Research Fund/American Institute for Cancer Research (WCRF/AICR) cancer prevention recommendations was associated with colorectal cancer incidence in the BWHS. The seven recommendations involved healthy weight, exercise, and dietary intake. Adherence to cancer prevention recommendations was low and not associated with colorectal cancer risk. The validity of existing recommendations in diverse populations needs further study, as well as whether there are alternative recommendations that are more beneficial for cancer prevention in specific populations.

Sonderman JS, Bethea TN, Kitahara CM, Patel AV, Harvey C, Knutsen SF, Park Y, Park SY, Fraser GE, Teras LR, Purdue MP, Stolzenberg-Solomon RZ, Gillanders EM, Palmer JR, Kolonel LN, Blot WJ. Multiple myeloma mortality in relation to obesity among African Americans. *J Natl Cancer Inst* 2016;108(10):djw120. doi: 10.1093/jnci/djw120.

Multiple myeloma (MM) is a relatively rare cancer that occurs more commonly among African Americans than among other population groups. Obesity also occurs more commonly among African Americans as well but its relation to multiple myeloma is undetermined. We combined data from seven cohort studies, including the BWHS, that tracked mortality among African Americans. MM mortality increased as body mass index increased and was 43% greater among those with body mass index of 35 or more relative to individuals with healthy weights. The findings suggest that obesity is a risk factor for MM and a contributor to the rising incidence rates of MM among African Americans.

Coogan PF, White LF, Yu J, Burnett RT, Marshall JD, Seto E, Brook RD, Palmer JR, Rosenberg L, Jerrett M. Long term exposure to NO<sub>2</sub> and diabetes incidence in the Black Women's Health Study. *Environ Res* 2016;140:360-6. doi: 10.1016/j.envres.2016.04.021.



Laboratory studies show that air pollutants can increase insulin resistance, but epidemiologic evidence on whether air pollution affects diabetes incidence is conflicting. We assessed traffic-related nitrogen dioxide (NO<sub>2</sub>) levels in relation to the incidence of type 2 diabetes in the BWHS. Based on 4387 participants who were diagnosed with diabetes during 1995 to 2011, we found no evidence of an increase in diabetes associated with levels of NO<sub>2</sub>.

Adams-Campbell LL, Dash C, Palmer JR, Wiedemeier M, Rosenberg L, Cozier YC. Predictors of biospecimen donation in the Black Women's Health Study. *Cancer Causes Control* 2016;27(6):797-803. doi: 10.1007/s10552-016-0747-0.

The participation of African-Americans in research involving biospecimens used in genetic studies (such as saliva/mouthwash or blood samples) has generally been low. However, in the BWHS, the response rate to an invitation to submit a saliva/mouthwash sample (which is a source of DNA) was high, 51%. The response rate was highest among older women and women who were health conscious, as indicated by a recent visit to a doctor or having had cancer screening (mammography, colonoscopy, PAP smear). The response in the BWHS is encouraging given published findings of low overall participation rates of African-Americans in genetic studies.

Park SY, Palmer JR, Rosenberg L, Haiman CA, Bandera EV, Bethea TN, Troester MA, Viscidi E, Kolonel LN, Olshan AF, Ambrosone CB. A case-control analysis of smoking and breast cancer in African American women: findings from the AMBER consortium. *Carcinogenesis* 2016;37(6):607-15. doi: 10.1093/carcin/bgw040.

In a collaborative project of four large studies of African American women, we examined associations between smoking and breast cancer. Results differed by menopausal status. Postmenopausal women who had smoked most heavily were estimated to have a 15% greater risk of breast cancer than postmenopausal women who had never smoked. Other studies have found similar results. By contrast, among premenopausal women, smokers had lower risk than nonsmokers, a finding that has not been observed before and requires confirmation.

White LF, Jerrett M, Yu J, Marshall JD, Rosenberg L, Coogan PF. Ambient air pollution and 16-year weight change in African-American women. *Am J Prev Med* 2016;51(4):e99-105. doi: 10.1016/j.amepre.2016.03.007.

Animal studies and epidemiologic studies in children have suggested that air pollution might contribute to weight gain. We investigated the association between air pollution and weight gain over 16 years of follow-up in the BWHS. The air pollutants assessed were fine particulate matter, ozone, and nitrogen dioxide, with levels based on measurements from a variety of sources. Our analyses suggested that air pollution does not increase weight gain.

Wise LA, Sponholtz TR, Rosenberg L, Adams-Campbell LL, Kuohung W, Palmer JR. History of uterine leiomyoma and risk of endometrial cancer in black women. *Cancer Causes Control* 2016;27(4):545-52. doi: 10.1007/s10552-016-0728-3.

Previous studies have found an association between uterine leiomyomata (fibroids in the womb) and cancer of the uterus. In the BWHS, based on 300 incident cases of endometrial cancer identified during follow-up, women with a history of uterine leiomyomata had a higher incidence of endometrial cancer compared to woman without such a history. The strongest association was observed for cancer diagnosed within two years of the diagnosis of uterine leiomyomata, suggesting that women with uterine leiomyomata may be under greater surveillance for cancer. Confirmation of these findings is needed.

Coogan PF, Castro-Webb N, Yu J, O'Connor G, Palmer JR, Rosenberg L. Neighborhood and individual socioeconomic status and asthma incidence in African American women. *Ethn Dis* 2016;26(1):113-22. doi: 10.18865/ed.26.1.113.

Previous studies have found that a woman's personal socioeconomic status (e.g., income and education) is related to her risk of developing asthma, with higher risk among women with fewer socioeconomic resources. It is possible that neighborhood socioeconomic status could also contribute to risk of developing asthma, for example in neighborhoods with more older buildings with higher levels of allergens. In a study in the BWHS that included 1520 women who developed asthma during follow-up, individual and neighborhood socioeconomic status were both assessed in relation to asthma incidence. Lower personal socioeconomic status was associated with increased asthma risk, as has been seen in other studies, whereas there was no association of neighborhood with risk.

Cozier YC, Albert MA, Castro-Webb N, Coogan PF, Ridker P, Kaufman HW, Palmer JR, Rosenberg L. Neighborhood socioeconomic status in relation to serum biomarkers in the Black Women's Health Study. *J Urban Health* 2016;93(2):279-91. doi: 10.1007/s11524-016-0034-0.

Low neighborhood socioeconomic status (SES) is associated with higher risk of cardiovascular disease (CVD), such as heart attacks. We assessed neighborhood SES in relation to several CVD biomarkers in blood samples provided by BWHS participants. The blood samples of 418 BWHS participants were assayed for C-reactive protein (CRP), hemoglobin A1C (hgA1C), and high-density lipoprotein (HDL) cholesterol. Women living in neighborhoods with lowest SES had the least favorable biomarker levels. These results suggest that neighborhood environments may affect physiological processes within residents independently of individual SES.

Bethea TN, Palmer JR, Rosenberg L, Cozier YC. Neighborhood socioeconomic status in relation to all-cause, cancer, and cardiovascular mortality in the Black Women's Health Study. *Ethn Dis* 2016;26(2):157-64. doi: 10.18865/ed.26.2.157.

Low neighborhood socioeconomic status (SES) is associated with poorer health. We assessed the relation of neighborhood SES to mortality in the BWHS. Based on 2,598 deaths during 1995-2011, lower neighborhood SES was associated with increased all-cause and cancer mortality irrespective of individual level of education. The presence of the association even among women with high levels of education suggests that high individual SES may not overcome the unfavorable influence of neighborhood deprivation on mortality.

Ruiz-Narváez EA, Haddad SA, Lunetta KL, Yao S, Bensen JT, Sucheston-Campbell LE, Hong CC, Haiman CA, Olshan AF, Ambrosone CB, Palmer JR. Gene-based analysis of the fibroblast growth factor receptor signaling pathway in relation to breast cancer in African American women: the AMBER consortium. *Breast Cancer Res Treat* 2016;155(2):355-63. doi: 10.1007/s10549-015-3672-0.

We assessed a genetic pathways that might be involved in breast cancer occurrence, namely the fibroblast growth factor receptor (FGFR) signaling pathway. We compared genetic variants in this pathway among women with and without breast cancer in a collaborative study of the BWHS with three other studies of African American women. We found an association of the FGFR2 gene with estrogen receptor positive breast cancer, and an association of the FGFR1 gene with estrogen receptor negative breast cancer. Thus, different genes in the same pathway may be associated with different breast cancer subtypes.

Allott EH, Cohen SM, Geradts J, Sun X, Khoury T, Bshara W, Zirpoli GR, Miller CR, Hwang H, Thorne LB, O'Connor S, Tse CK, Bell MB, Hu Z, Li Y, Kirk EL, Bethea TN, Perou CM, Palmer JR, Ambrosone CB, Olshan AF, Troester MA. Performance of three-biomarker immunohistochemistry for intrinsic breast cancer subtyping in the AMBER consortium. *Cancer Epidemiol Biomarkers Prev* 2016;25(3):470-8. doi: 10.1158/1055-9965.EPI-15-0874.

Breast cancer is not a single disease but rather is made up of various subtypes. Based on breast cancer tumor tissue from a consortium of studies of breast cancer in Black women that included the BWHS, we compared classification into subtypes by a three-biomarker immunohistochemistry (IHC) method with classification by an RNA-based method and classification by estrogen and progesterone receptor status; the latter classification is commonly used in hospitals to guide treatment. The IHC-based method had reasonable accuracy for distinguishing the basal-like subtype (which has a poorer prognosis) from non-basal like cancers, but addition biomarkers were needed to distinguish other subtypes.

Bethea TN, Rosenberg L, Castro-Webb N, Lunetta KL, Sucheston-Campbell LE, Ruiz-Narváez EA, Charlot M, Park SY, Bandera EV, Troester MA, Ambrosone CB, Palmer JR. Family history of cancer in relation to breast cancer subtypes in African American women. *Cancer Epidemiol Biomarkers Prev* 2016;25(2):366-73. doi: 10.1158/1055-9965.EPI-15-1068.

A woman's family history of various cancers may be related to her chance of developing breast cancer, but evidence has been conflicting. We assessed the relation of a woman's

first-degree family history (in her mother, father, sisters, brothers, or children) of breast cancer and several other cancers (e.g., prostate, lung, colon, cervix) to her risk of developing breast cancer. This was a collaborative study of the BWHS with three other studies that included African American women. First degree family history of breast cancer was associated with a 70% increase in a woman's own risk of developing breast cancer, whereas having a family history of both breast cancer and prostate cancer was associated with an increase three times that great. These findings suggest that greater surveillance and screening for breast cancer may be needed for women with a family history of both breast and prostate cancer.

Yao S, Haddad SA, Hu Q, Liu S, Lunetta KL, Ruiz-Narváez EA, Hong CC, Zhu Q, Sucheston-Campbell L, Cheng TYD, Bensen JT, Johnson CS, Trump DL, Haiman CA, Olshan AF, Palmer JR, Ambrosone CB. Genetic variations in vitamin D-related pathways and breast cancer risk in African American women in the AMBER Consortium. *Int J Cancer* 2016;138(9):2118-26.

Vitamin D deficiency is more common among African Americans than among other racial groups. We assessed whether vitamin D-related genetic pathways are involved in breast cancer risk in the BWHS and three other studies of African American women. To do so, we compared genetic variants in vitamin-D related pathways among women with and without breast cancer. Several genetic variants were related to breast cancer risk, and one in particular was related to estrogen receptor negative breast cancer, a subtype that occurs more commonly among African American women. These results support a possible role for vitamin D in the occurrence of breast cancer subtypes.

Cheng TYD, Ambrosone CB, Hong CC, Lunetta KL, Liu S, Hu Q, Yao S, Sucheston-Campbell L, Bandera EV, Ruiz-Narváez EA, Haddad S, Troester MA, Haiman CA, Bensen JT, Olshan AF, Palmer JR, Rosenberg L. Genetic variants in the mTOR pathway and breast cancer risk in African American women. *Carcinogenesis* 2016;37(1):49-55. doi: 10.1093/carcin/bgv160.

Estrogen receptor negative (ER-) breast cancer is a subtype of breast cancer that occurs more commonly in black women than white women. Because ER- cancer includes "triple negative" breast cancer, a subtype that has a poorer prognosis than other subtypes, there has been a search for genetic variants that may be associated with higher or reduced risk of ER- cancer. In the present collaborative study that involved BWHS and three other studies of African American women, we assessed genetic variants in a pathway, mTOR that might play a role in the development of breast cancer. Several variants were found to be related to risk of ER- breast cancer. If confirmed, these findings suggest a mechanism that might help to explain the occurrence of ER- breast cancer in black women.

Rosenberg L, Bethea TN, Viscidi E, Hong CC, Troester MA, Bandera EV, Haiman CA, Kolonel LN, Olshan AF, Ambrosone CB, Palmer JR. Postmenopausal female hormone use and estrogen-receptor positive and negative breast cancer in African-American women. *J Natl Cancer Inst* 2016;108(4):djv361. doi: 10.1093/jnci/djv361.

Medications with estrogen together with progestin, such as PremPro, are used to treat menopausal symptoms. Their use has been associated with increased incidence of

estrogen receptor-positive (ER+) breast cancer in White women. Using data from the BWHS and three other large studies of Black women, we found that the incidence of ER+ cancer was increased in users of estrogen with progestin, but not in users of medications that contained estrogen alone. There is now a great deal of evidence suggesting a cause-effect relationship between combination therapy and ER+ breast cancer. A decrease in use would be expected to reduce the number of ER+ cancers. Women of any ethnic group using drugs containing estrogen with progestin for the relief of menopausal symptoms should use them for as short a time as possible.

Ruiz-Narváez EA, Haddad SA, Rosenberg L, Palmer JR. Birth weight modifies the association between central-nervous-system gene variation and adult body mass index. *J Hum Genet* 2016;61(3):193-8. doi: 10.1038/jhg.

Numerous genetic variants are associated with body mass index (a measure of body size). It has also been found that people born with a low birth weight have an increased risk of disorders that involve weight control, which suggests that normal regulation of body weight is disrupted in people with low birth weight. We found that certain central nervous system genetic variants associated with weight affected the relation of birth weight to adult body mass index in the BWHS. These results support the theory that low-birth weight disrupts mechanisms of body weight regulation.

Brasky TM, Sponholtz TR, Palmer JR, Rosenberg L, Ruiz-Narváez EA, Wise LA. Associations of dietary long-chain omega-3 fatty acids and fish with endometrial cancer risk in the Black Women's Health Study. *Am J Epidemiol* 2016;183(3):199-209. doi: 10.1093/aje/kwv231.

Inflammation may be a pathway involved in the development of endometrial cancer (cancer of the lining of the womb). Fatty fish contain a substance, a "fatty acid", that is thought to reduce inflammation. If this is so, fish consumption might lower risk of developing endometrial cancer. We assessed this possibility in the BWHS and found that fish intake was related only weakly to the overall incidence of endometrial cancer. There was a hint of a lower risk for fish consumption among leaner women, but assessment of this possibility will require larger numbers.

Coogan PF, White LF, Yu J, Burnett RT, Seto E, Brook RD, Palmer JR, Rosenberg L, Jerrett M. PM<sub>2.5</sub> and diabetes and hypertension incidence in the Black Women's Health Study. *Epidemiology* 2016;27(2):202-10. doi: 10.1097/EDE.0000000000000418.

Exposure to a component of air pollution called fine particulate matter (PM<sub>2.5</sub>) has been linked to increases in insulin resistance and blood pressure, raising the possibility that PM<sub>2.5</sub> could increase the incidence of diabetes and hypertension. In a study of BWHS participants living in 56 metropolitan areas across the US, we first estimated PM<sub>2.5</sub> levels and then assessed whether levels were related to the occurrence of type 2 diabetes or hypertension. Our analysis suggested that PM<sub>2.5</sub> dose not increase the incidence of either condition.

Sponholtz TR, Palmer JR, Rosenberg L, Hatch EE, Adams-Campbell LL, Wise LA. Body size, metabolic factors, and risk of endometrial cancer in black women. *Am J Epidemiol* 2016;183(4):259-68. doi: 10.1093/aje/kwv186.

Cancer of the endometrium (the lining of the womb) occurs more commonly among white women who are overweight or obese or have type 2 diabetes, but whether this is the case among African American women has received little study. In an assessment of these issues within the BWHS, we found that the incidence of endometrial cancer increased as body mass index increased. There was also an increased risk of this cancer among women who had diabetes. Thus, overweight and diabetes appear to have similar effects on endometrial cancer incidence in black and white women.

## 2015

Haddad SA, Lunetta KL, Ruiz-Narváez EA, Bensen JT, Hong CC, Sucheston-Campbell LE, Yao S, Bandera EV, Rosenberg L, Haiman CA, Troester MA, Ambrosone CB, Palmer JR. Hormone-related pathways and risk of breast cancer subtypes in African American women. *Breast Cancer Res Treat* 2015;154(1):145-54. doi: 10.1007/s10549-015-3594-x.

We investigated genetic variation in hormone pathways in relation to risk of breast cancer overall and of specific subtypes, using genetic information from the BWHS and three other large studies of Black women. We identified several genes in hormone pathways that were associated with risk of breast cancer overall or of the estrogen receptor negative subtype, which occurs more commonly among Black women. These results provide clues about mechanisms involved in breast cancer occurrence.

Wise LA, Radin RG, Rosenberg L, Adams-Campbell L, Palmer JR. History of uterine leiomyomata and incidence of breast cancer. *Cancer Causes Control* 2015;26(10):1487-93. doi: 10.1007/s10552-015-0647-8.

Some studies have found associations of uterine fibroids with increased risk of cancer of the uterus (womb). We found that a history of uterine fibroids was associated with an increase in the risk of endometrial cancer (cancer of the lining of the womb) in the BWHS. This association has plausibility because both conditions are related to female hormone levels.

Ambrosone CB, Zirpoli G, Hong CC, Yao S, Troester MA, Bandera EV, Schedin P, Bethea TN, Borges V, Park SY, Chandra D, Rosenberg L, Kolonel LN, Olshan AF, Palmer JR. Important role of menarche in development of estrogen receptor negative breast cancer in African American women. *J Natl Cancer Inst* 2015;107(9):dju172. doi: 10.1093/jnci/dju172.

African American women experience higher rates of ER- (estrogen receptor-negative) breast cancer, an aggressive type of breast cancer, than white women. African American women also, on average, have an earlier age at menarche (first period) than other U.S. women. Causes of ER- breast cancer have not been clearly established. Data from the BWHS and three other studies with large numbers of African American women (the

AMBER Consortium) were used to assess the relationship of age at menarche with risk of ER- and ER+ breast cancer. Risk of ER+ breast cancer was increased among women with longer intervals between menarche and the birth of the first child, whereas later menarche was associated with lower risk of ER- breast cancer regardless of childbearing. These differences suggest that the biologic pathways influencing risk of ER- and ER+ breast cancer may differ.

Bandera EV, Chandran U, Hong CC, Troester MA, Bethea TN, Adams-Campbell LL, Haiman CA, Park SY, Olshan AF, Ambrosone CB, Palmer JR, Rosenberg L. Obesity, body fat distribution, and risk of breast cancer subtypes in African American women participating in the AMBER Consortium. *Breast Cancer Res Treat* 2015;150(3):655-66. doi: 10.1007/s10549-015-3353-z.

Data from the BWHS and three other studies were used to assess the relationships of obesity and body fat distribution to different subtypes of breast cancer, including triple negative (TN) cancer, which occurs more commonly in Black women. Relationships differed according to the subtype of cancer and menopausal status. Higher body mass index was associated with increased risk of postmenopausal estrogen receptor positive (ER+) cancer and with decreased risk of postmenopausal TN cancer. Higher body mass index around the age of 18 was associated with decreased risk of premenopausal ER+ cancer and all subtypes of postmenopausal cancer. High waist-to-hip ratio, a measure of body fat distribution around the waist, was associated with increased risk of ER+ tumors. Different biologic mechanisms may be at work and more research is needed to understand the interplay between weight, body fat distribution, and breast cancer.

Bethea TN, Rosenberg L, Hong CC, Troester MA, Lunetta KL, Bandera EV, Schedin P, Kolonel LN, Olshan AF, Ambrosone CB, Palmer JR. A case-control analysis of oral contraceptive use and breast cancer subtypes in the African American Breast Cancer Epidemiology and Risk Consortium. *Breast Cancer Res* 2015;17(22):1-13. doi: 10.1186/s13058-015-0535-x.

Previous studies have found that women who have recently used oral contraceptives have a higher risk of breast cancer, which dissipates after use ceases. This large study, based on the BWHS and three other studies, examined the association between oral contraceptive use and specific subtypes of breast cancer, namely estrogen receptor positive, estrogen receptor negative, and triple negative breast cancer. Long-term and recent oral contraceptive use were associated with increased risk of all subtypes of cancer. The risk decreased over time after use was halted.

Boggs DA, Ban Y, Palmer JR, Rosenberg L. Higher diet quality is inversely associated with mortality in African-American women. *J Nutr* 2015;145(3):547-54. doi: 10.3945/jn.114.195735.

In an assessment of whether dietary intake is associated with risk of dying, information on food intake provided by Black Women's Health Study participants in 1995 and 2001 was used to define several dietary patterns, such as the "Western" pattern. The Western pattern is a common pattern in the U.S., characterized by high intake of meat, fats, and sweets. The death rate was higher among BWHS participants with a Western type of diet

whereas it was lower among women whose diets were high in whole grains, fruits, and vegetables. These findings are similar to results in other populations and strengthen the evidence that type of dietary intake can increase or decrease the risk of dying.

Vimalananda VG, Palmer JR, Gerlovin H, Wise LA, Rosenzweig JL, Rosenberg L, Ruiz-Narvaez EA. Night-shift work and incident diabetes among African-American women. *Diabetologia* 2015;58(4):699-706. doi: 10.1007/s00125-014-3480-9.

In 2005 BWHS participants reported information on whether and how long they had worked night shifts. Based on follow-up through 2013, the incidence of type 2 diabetes in the BWHS was greater among women who had worked a night shift for at least 10 years than among women who had not worked night shifts. The relationship was present in women who were overweight or obese as well as in thinner women, indicating that the mechanism for the increase was not through weight. A possible mechanism may involve sleep disturbances, which are increasingly being associated with adverse health effects.

Coogan PF, Castro-Webb N, Yu J, O'Connor GT, Palmer JR, Rosenberg L. Active and passive smoking and the incidence of asthma in the Black Women's Health Study. *Am J Respir Crit Care Med* 2015;191(2):168-76. doi: 10.1164/rccm.201406-1108OC.

With BWHS data on smoking ("active") and exposure to the smoke of others ("passive"), we examined the development of adult-onset asthma among past smokers, current smokers, non-smokers who were exposed to the smoke of others (passive smokers), and non-smokers never exposed to the smoke of others. Current active smoking was associated with the greatest increase in risk of adult-onset asthma. Passive smokers also experienced a higher risk but less than that of active smokers. These results suggest that avoiding smoking and reducing exposure to tobacco smoke could help to prevent the development of adult-onset asthma.

Wise LA, Li S, Palmer JR, Rosenberg L. Depressive symptoms and risk of uterine leiomyomata. *Am J Obstet Gynecol* 2015;212(5):617.e1-10. doi: 10.1016/j.ajog.2014.12.012.

Depression can affect the production of female hormones, which are thought to be involved in the development of uterine leiomyomata. In a study in the BWHS, the incidence of uterine fibroids was a little higher among women who reported more depressive symptoms than in women with fewer symptoms. This finding supports the idea that disruption of female hormones can influence risk of uterine fibroids.

Boggs DA, Rosenberg L, Adams-Campbell LL, Palmer JR. Prospective approach to breast cancer risk prediction in African American women: the Black Women's Health Study model. *J Clin Oncol* 2015;33(9):1038-44. doi: 10.1200/JCO.2014.57.2750.

Breast cancer prediction models that are currently used underestimate risk of breast cancer for African American women, resulting in lower rates of recruitment into breast cancer prevention trials. Based on data collected from Black Women's Health Study (BWHS) participants from 1995 to 2005, BWHS developed a prediction model that



includes more factors than used in previous models. The model was then tested in BWHS data from 2006-2011. The results suggested an improvement on current prediction models among African American women. Use of the new model could result in an increase in the number of Black women eligible for breast cancer prevention trials, which in turn would ensure that new prevention methods are applicable to African American women.

Palmer JR, Kipping-Ruane K, Wise LA, Yu J, Rosenberg L. Lactation in relation to long-term maternal weight gain in African-American women. *Am J Epidemiol* 2015;181(12):932-9. doi: 10.1093/aje/kwv027.

The BWHS and other studies have previously shown that childbearing is associated with weight gain in the years following a pregnancy. In an analysis of the association of breast feeding with weight gain after pregnancy, BWHS participants who had a body mass index less than 30 before pregnancy and who breastfed their babies after the pregnancy gained a little less weight than similar women who did not breast feed, but this was not the case among heavier women who breast fed their babies. While the beneficial effect of breastfeeding on the health of babies is clear, the effect of breastfeeding on weight gain is likely very small.

Cozier YC, Coogan PF, Govender P, Berman JS, Palmer JR, Rosenberg L. Obesity and weight gain in relation to incidence of sarcoidosis in US Black women: data from the Black Women's Health Study. *Chest* 2015;147(4):1086-93. doi: 10.1378/chest.14-1099.

Sarcoidosis, an inflammatory autoimmune disease that can affect the lungs and other organs, disproportionately affects Black women. Overweight and obesity causes inflammation. BWHS data was used to examine whether there is an association between weight and sarcoidosis. Weight gain and obesity were both associated with increased incidence of sarcoidosis. While plausible, this is the first report of such associations and they need to be confirmed in other studies.

Felix AS, [...], Palmer JR, Rosenberg L, Wise LA, et al. Intrauterine devices and endometrial cancer risk: a pooled analysis of the Epidemiology of Endometrial Cancer Consortium. *Int J Cancer* 2015; 136(5):E410-22. doi: 10.1002/ijc.29229.

The Endometrial Cancer Consortium combines data from 18 separate studies, including the BWHS, to assess risk factors for endometrial cancer. Based on 8,801 cases of endometrial cancer, use of IUDs of various types was associated with reduced risk of endometrial cancer. To fully understand the biology of the decrease in risk, additional study is needed. In addition, further study of the types of IUDs currently available in the US is needed.

## 2014

Cohen SS, Park Y, Signorello LB, Patel AV, Boggs DA, Kolonel LN, Kitahara CM, Knutsen SF, Gillanders E, Monroe KR, Berrington de Gonzalez A, Bethea TN, Black A, Fraser G, Gapstur S,

Hartge P, Matthews CE, Park SY, Purdue MP, Singh P, Harvey C, Blot WJ, Palmer JR. A pooled analysis of body mass index and mortality among African Americans. *PLoS ONE* 2014;9(11):e111980. doi: 10.1371/journal.pone.0111980.

This study combined BWHS data with data from six other studies to assess the relationship between body mass index (BMI) and death by any cause (all-cause mortality). Among African American men and women, obesity (defined as a BMI of at least 30) was associated with a higher risk of all-cause mortality. The relationship with obesity was strongest among for death from cardiovascular disease. This study demonstrates the importance of personal and public health policy efforts that help individuals attain and maintain a healthy weight.

Rosenberg L, Palmer JR, Bethea TN, Ban Y, Kipping-Ruane K, Adams-Campbell LL. A prospective study of physical activity and breast cancer incidence in African American women. *Cancer Epidemiol Biomarkers Prev* 2014;23(11):2522-31. doi: 10.1158/1055-9965.EPI-14-0448.

Physical activity has been associated with a reduced risk of breast cancer, but the relationship needs confirmation in African American populations. In the BWHS, higher levels of vigorous exercise and brisk walking were related to decreased risk of breast cancer.

Bethea TN, Kitahara CM, Sonderman J, Patel AV, Harvey C, Knutsen SF, Park Y, Park SY, Fraser GE, Jacobs EJ, Purdue MP, Stolzenberg-Solomon RZ, Gillanders EM, Blot WJ, Palmer JR, Kolonel LN. A pooled analysis of body mass index and pancreatic cancer mortality in African Americans. *Cancer Epidemiol Biomarkers Prev* 2014;23(10):2119-25. doi: 10.1158/1055-9965.EPI-14-0422.

African Americans are more likely to be diagnosed with and die from pancreatic cancer than other Americans. Data from 7 studies, including the BWHS, was used to assess the possible relationship between obesity and death from pancreatic cancer among African American women and men. Obesity was related to increased mortality from pancreatic cancer, particularly among people who had never smoked. Reducing obesity may reduce pancreatic cancer mortality.

Palmer JR, Viscidid E, Troester MA, Hong C, Schedin P, Bethea TN, Bandera EV, McKinnon C, Haiman CA, Lunetta K, Kolonel LN, Rosenberg L, Olshan AF, Ambrosone CB. Parity, Lactation and breast cancer subtypes in African American women: results from the AMBER Consortium. *J Natl Cancer Inst* 2014;106(10):dju237. doi: 10.1093/jnci/dju237.

Estrogen negative (ER-) breast cancer is an aggressive form of breast cancer that occur more commonly among African American women. In an analysis of data from four studies, including the BWHS, women who had at least one birth were at increased risk of ER- and triple-negative breast cancer, but the increase was reduced if they had breast fed. ER+ breast cancer, another subtype, was not related to parity or lactation. These results suggest that breastfeeding could reduce the risk of ER- breast cancer in African American women.

James-Todd TM, Boggs DA, Rich-Edwards JW, Rosenberg L, Wise LA, Palmer JR. Preterm birth and subsequent risk of type 2 diabetes in Black mothers. *Epidemiology* 2014;25(6):805-10. doi: 10.1097/EDE.000000000000167.

In this BWHS study, the relationship between preterm birth and risk of type 2 diabetes was examined. Women who had a preterm birth (a baby born before the 37<sup>th</sup> week of pregnancy) were 20% more likely to report developing type 2 diabetes, and those who had a very premature birth (before the 32<sup>nd</sup> week of pregnancy) had an even higher risk. These results suggest that efforts to reduce preterm births could also reduce the risk of type 2 diabetes among Black women.

Feng Y, [...], Palmer JR, et al. A comprehensive examination of breast cancer risk loci in African American women. *Hum Mol Genet* 2014;23(20):5518-26. doi: 10.1093/hmg/ddu252.

Genetic studies of European populations have identified 73 genetic variants related to breast cancer risk, but genetic structures differ somewhat by ethnic group and these variants may not have the same relation to breast cancer risk among women of African ancestry. Among 54 variants examined in the present study, which included BWHS data, 38 that were associated with breast cancer, and several previously unidentified variants were also associated with risk. Additional research is needed to confirm and extend these findings.

Ruiz-Narváez EA, Palmer JR, Gerlovin H, Wise LA, Vimalananda VG, Rosenzweig JL, Rosenberg L. Birth weight and risk of type 2 diabetes in the Black Women's Health Study: does adult body mass index play a mediating role? *Diabetes Care* 2014;37(9):2572-8. doi: 10.2337/dc14-0731.

The occurrence of type 2 diabetes is higher among African Americans than among white Americans. This BWHS study examined whether a woman's birthweight was associated with her risk of diabetes in adulthood. Compared to women who had a normal birthweight (5lb 8oz-8lb13oz), risk of type 2 diabetes was 40% higher among women with very low birthweight (less than 3lb 5oz) and 13% higher risk among women with low birthweight (3lb5oz-5lb8oz). The increase in diabetes risk was not explained by adult body size. These results suggest that having been born prematurely may contribute to a woman's risk of developing diabetes in adulthood.

Wise LA, Ruiz-Narváez EA, Haddad SA, Rosenberg L, Palmer JR. Polymorphisms in vitamin D-related genes and risk of uterine leiomyomata. *Fertil Steril* 2014;102(2):503-10.e1. doi: 10.1016/j.fertnstert.2014.04.037.

Recent studies have suggested an association between uterine leiomyomata (uterine fibroids) and vitamin D deficiency (which is related to vitamin D intake, sun exposure, and skin pigmentation). Specific genetic variants involved in vitamin D metabolism and skin pigmentation were assessed in relation to uterine leiomyomata in the BWHS. Several genetic variants occurred more commonly among women with fibroids than

among women without fibroids, supporting the idea of an association between vitamin D metabolism and uterine leiomyomata. Further study of this possible association is needed.

Vimalananda VG, Palmer JR, Gerlovin H, Wise LA, Rosenzweig JL, Rosenberg L, Ruiz-Narváez EA. Depressive symptoms, antidepressant use, and the incidence of diabetes in the Black Women's Health Study. *Diabetes Care* 2014;37(8):2211-7. doi: 10.2337/dc13-2642.

This BWHS study assessed whether depressive symptoms and use of antidepressant medications are related to development of type 2 diabetes in the BWHS. Based on questions that participants completed in 1999 on depressive symptoms and 3,372 new cases of diabetes that occurred during the next 12 years, depressive symptoms and antidepressant medication use were found to be associated with a higher risk of diabetes.

Wise LA, Radin RG, Kumanyika S, Ruiz-Narvaez EA, Palmer JR, Rosenberg L. Prospective study of dietary fat and risk of uterine leiomyomata. *Am J Clin Nutr* 2014;99(5):1105-16. doi: 10.3945/ajcn.113.073635.

High intake of dietary fat has been associated with higher levels of female hormones, and thus has the possibility of affecting the occurrence of uterine fibroids. In our large study within the BWHS, the only consistent association was a small increase in risk associated with intake of marine fatty acids. This finding needs to be confirmed in other studies.

Boggs DA, Palmer JR, Rosenberg L. Bilateral oophorectomy and risk of cancer in African American women. *Cancer Causes Control* 2014;25(4):507-13. doi: 10.1007/s10552-014-0353-y.

Previous research suggests that bilateral oophorectomy (removal of the both ovaries) at younger ages may reduce risk of breast cancer, with some suggestion that the removal increases the risk of lung and colorectal cancer. In this BWHS study, bilateral oophorectomy, regardless of age at removal, was associated with a decreased risk of estrogen-receptor positive breast cancer but not with risk of estrogen receptor negative breast cancer. Results on risk of colorectal or lung cancer, based on small numbers, suggested a possible increase in risk. Having a hysterectomy (removal of the uterus) without removal of the ovaries did not affect risk of breast, lung, or colorectal cancer.

Cozier YC, Yu J, Coogan PF, Bethea TN, Rosenberg L, Palmer JR. Racism, segregation, and risk of obesity in the Black Women's Health Study. *Am J Epidemiol* 2014;179(7):875-83. doi: 10.1093/aje/kwu004.

Experiences of racism are stressors that might result in increased obesity, for example through changes in eating or exercise habits. In the BWHS, the occurrence of obesity was greater among women who had the greatest experiences of racism. This was the case whether women lived in segregated or nonsegregated neighborhoods.

Coogan PR, Yu J, O'Connor GT, Brown TA, Palmer JR, Rosenberg L. Depressive symptoms and the incidence of adult-onset asthma in African American women. *Ann Allergy Asthma Immunol* 2014;112(4):333-8.e1. doi: 10.1016/j.anai.2013.12.025.

Some evidence suggests that depression could lead to increased incidence of asthma. In this first study of that hypothesis in African American women, the incidence was greatest among women who had the most symptoms of depression. Confirmation of this finding in further studies is needed.

Ruiz-Narvaez EA. Redundant enhancers and causal variants in the TCG7LC gene. *Eur J Hum Genet* 2013;22(11):1243-6. doi: 10.1038/ejhg.2014.17.

The author suggests some possible reasons to explain the fact that genetic variants discovered to date appear to explain very little of the occurrence of various illnesses.

Palmer JR, Ambrosone CB, Olshan AF. A collaborative study of the etiology of breast cancer subtypes in African American women: the AMBER Consortium. *Cancer Causes Control* 2014;25(3):309-19. doi: 10.1007/s10552-013-0332-8.

Black women are more likely than other women to be affected by an aggressive form of breast cancer called estrogen receptor negative (ER-), which contributes to higher breast cancer mortality rates among Black women compared to other American women. The risk factors for ER- cancer are poorly understood and informative assessments require large numbers of women with this subtype. The BWHS has joined with three other large studies of breast cancer in Black women in a collaborative study, the AMBER consortium, to assess nongenetic and genetic risk factors for ER- and other breast cancer subtypes in Black women.

Dash C, Palmer JR, Boggs DA, Rosenberg L, Adams-Campbell LL. Type 2 diabetes and the risk of colorectal adenomas: Black Women's Health Study. *Am J Epidemiol* 2014;179(1):112-9. doi: 10.1093/aje/kwt227.

Results from studies of type 2 diabetes in relation to the incidence of tumors of the colon and rectum have been contradictory. We assessed type 2 diabetes in relation to the occurrence of colorectal adenomas in the BWHS. Adenomas are precursors to colorectal cancer. There was no overall association of diabetes with colorectal adenoma occurrence.

Coogan PF, Yu J, O'Connor GT, Brown TA, Cozier YC, Palmer JR, Rosenberg L. Experiences of racism and the incidence of adult-onset asthma. *Chest* 2014;145(3):480-5. doi: 10.1378/chest.13-0665.

In the BWHS, more than 1000 women have reported the development of asthma. We found that the incidence of asthma was increased among women who reported high levels of experiences of racism. It may be that chronic stress resulting from experiences of racism increases the incidence of adult-onset asthma through effects on the immune system and the airways.

Rosenberg L, Boggs DA, Bethea TN, Adams-Campbell LL, Palmer JR. A prospective study of smoking and breast cancer risk among African American women. *Cancer Causes Control* 2013;24(12):2207-15. doi: 10.1007/s10552-013-0298-6.

Active smoking and passive smoking (exposure to the smoke of others) have been assessed in relation to breast cancer in many studies, but rarely in Black women. There is uncertainty as to whether passive smoking is associated with increased risk. In the BWHS, both active and passive smoking were associated with increased risk of breast cancer. Women who smoked most heavily and who began smoking at young ages were at highest risk.

Boggs DA, Rodríguez-Bernal CL, Rosenberg L, Palmer JR. Long-term diet quality is associated with lower obesity risk in young African American women with normal BMI at baseline. *J Nutr* 2013;143(10):1636-41. doi: 10.3945/jn.113.179002.

To determine whether diet quality affects weight gain, we assessed dietary patterns in relation to weight gain among BWHS participants who were ages 21-39 at the start of follow-up. These ages were studied because most weight gain in adults occurs before age 40. Two dietary patterns were assessed in 1995 and in 2001. Women who maintained high quality diets over time had a lower risk of becoming obese. The healthiest diets were low in red and processed meats and high in whole grains, fruits, and vegetables.

Wise LA, Palmer JR, Rosenberg L. Body size and time-to-pregnancy in Black women. *Hum Reprod* 2013;28(10):2856-64. doi: 10.1093/humrep/det333.

With information from BWHS participants who reported a pregnancy attempt during 1995-2011, we found that heavier women were less likely to have been successful in becoming pregnant. These findings add to the growing body of research showing that excess weight is associated with reduced success in becoming pregnant.

Boggs DA, Rosenberg L, Charlot M, O'Connor GT, Adams-Campbell LL, Palmer JR. Restaurant foods, sugar-sweetened soft drinks, and obesity risk among young African American women. *Ethn Dis* 2013;23(4):445-51.

People who eat food from restaurants tend to consume more calories than those who prepare their food at home, because restaurant meals, particularly from fast food restaurants, often contain more fats and more calories. Most weight gain among women in the BWHS occurs before age 45. We found that young BWHS participants who ate meals often from restaurants, particularly meals of burgers, were at higher risk of becoming obese. This was also the case for women who frequently consumed sugar – sweetened soft drinks.

Liu C, ..., Ruiz-Narváez EA, Rosenberg L, Palmer JR, et al. Genome-wide association of body fat distribution in African ancestry populations suggests new loci. *PLoS Genet* 2013;9(8):e1003681. doi: 10.1371/journal.pgen.1003681.

In recent years, there has been increasing evidence that body fat at the waist has a worse effect on health than body fat at the hips. The BWHS contributed information to a genetic study of body fat distribution in populations of African ancestry. Some genetic variants associated with body fat at the waist were identified.

Bethea TN, Rosenberg L, Charlot M, O'Connor GT, Adams-Campbell LL, Palmer JR. Obesity in relation to lung cancer incidence in African American women. *Cancer Causes Control* 2013;24(9):1695-703. doi: 10.1007/s10552-013-0245-6.

In recent years, there has been increasing evidence that body fat at the waist has a worse effect on health than body fat at the hips. The BWHS contributed information to a genetic study of body fat distribution in populations of African ancestry. Some genetic variants associated with body fat at the waist were identified.

Rosenberg L, Kipping-Ruane KL, Boggs DA, Palmer JR. Physical activity and the incidence of obesity in young African-American women. *Am J Prev Med* 2013;45(3):262-8. doi: 10.1016/j.amepre.2013.04.016.

BWHS participants who exercised vigorously were less likely to become obese than less active women. Women who walked briskly also appeared to have a lower risk, although the results were less clear than for vigorous exercise. These effects on weight were independent of dietary factors and other factors related to weight gain.

Tukey MH, Berman JS, Boggs DA, White LF, Rosenberg L, Cozier YC. Mortality among African American women with sarcoidosis: data from the Black Women's Health Study. *Sarcoidosis Vasc Diffuse Lung Dis* 2013;30(2):128-33.

Sarcoidosis is a chronic autoimmune disease that disproportionately affects Black women. This study found that mortality among women in the BWHS with sarcoidosis was greater than that among women free of the illness.

Cozier YC, Ruiz-Narváez EA, McKinnon CJ, Berman JS, Rosenberg L, Palmer JR. Replication of genetic loci for sarcoidosis in U.S. Black women: data from the Black Women's Health Study. *Hum Genet* 2013;132(7):803-10. doi: 10.1007/s00439-013-1292-5.

This study examined possible genetic markers for sarcoidosis in the BWHS. The results support the conclusions of previous studies, which identified several specific genetic variants related to increased risk and others related to decreased risk. In addition, this study examined genetic markers of ancestry, and found that a higher percent African ancestry is related to an increased risk of sarcoidosis.

Wise LA, Palmer JR, Ruiz-Narváez EA, Reich DE, Rosenberg L. Is the observed association between dairy intake and fibroids in African Americans explained by genetic ancestry? *Am J Epidemiol* 2013;178(7):1114-9. doi: 10.1093/aje/kwt091.

African American women are more likely to develop uterine fibroids than other women and also more likely to be lactose intolerant and avoid dairy products. In the BWHS, participants with low intake of dairy products were more likely to develop fibroids than women with high intake. To see if this difference was explained by genetic factors (such as might be linked to lactose intolerance), we assessed whether % African ancestry explained the difference in fibroids risk in the BWHS between women with low and high intakes of dairy products. This measure of ancestry did not explain the difference.

Li S, Rosenberg L, Wise LA, Boggs DA, LaValley M, Palmer JR. Age at natural menopause in relation to all-cause and cause-specific mortality in a follow-up study of U.S. Black women. *Maturitas* 2013;75(3):246-52. doi: 10.1016/j.maturitas.2013.04.003.

The relation of early age at menopause to mortality has not previously been assessed among African American women. In the BWHS, having a natural menopause before age 45 was associated with a small increase in the risk of death.

Monda KL, ..., Palmer JR, Ruiz-Narváez EA, et al. A meta-analysis identifies new loci associated with body mass index in individuals of African ancestry. *Nat Genet* 2013;45(6):690-6. doi: 10.1038/ng.2608.

In a large analysis that gathered data from many studies of people of African ancestry, genetic variants associated with body mass index were identified. Some variants were the same as those identified in white and Asian populations, indicating that there are shared genetic variants related to body size across populations of diverse ancestry.

Demerath EW, ..., Palmer JR, Ruiz-Narváez EA, et al. Genome-wide association study of age at menarche in African-American women. *Hum Mol Genet* 2013;22(16):3329-46. doi: 10.1093/hmg/ddt181 (epub ahead of print).

African American women on average start having periods at an earlier age than women of European ancestry. The BWHS contributed information to a study of African American women, which included information from a large number of studies. Several genetic variants, including some associated with age at menarche in white women, were identified. It is hoped that studies of genetic variants will give clues as to why and how some women have an earlier age at start of periods.

Warner ET, Tamimi RM, Boggs DA, Rosner B, Rosenberg L, Colditz GA, Palmer, JR. Estrogen receptor positive tumors: do reproductive factors explain differences in incidence between Black and white women? *Cancer Causes Control* 2013;24(4):731-9. doi: 10.1007/s10552-013-0153-9.

A subtype of breast cancer, estrogen receptor- positive cancer (ER+), occurs less commonly among Black women than among white women. In an analysis of data on risk factors for ER+ breast cancer from the BWHS and from a similar follow-up study of white women, differences in reproductive factors only partly explained the difference in incidence between the two populations.



Boggs DA, Rosenberg L, Pencina MJ, Adams-Campbell LL, Palmer JR. Validation of a breast cancer risk prediction model developed for African American women. *J Natl Cancer Inst* 2013;105(5):361-7. doi: 10.1093/jnci/djt008.

Breast cancer risk prediction models are used to estimate a woman's individual risk, which in turn is used to judge whether the woman is at high enough risk to be enrolled in breast cancer prevention trials, how often she should have a mammogram, and whether she is a candidate for breast cancer chemoprevention. The CARE model, which was developed for Black women, was assessed in the BWHS. It underestimated breast cancer risk, and its predictive ability was modest, worse for estrogen receptor-negative breast cancer than for estrogen receptor-positive breast cancer. Further work will be focused on efforts to improve the model.

Wise LA, Palmer JR, Rosenberg L. Lifetime abuse victimization and risk of uterine leiomyomata in Black women. *Am J Obstet Gynecol* 2013;208(4):272.e1-13. doi: 10.1016/j.ajog.2012.12.034.

In a study in the BWHS, both physical and sexual abuse during childhood were associated with a higher incidence of uterine fibroids, with a stronger association for sexual abuse. These results add to the evidence that stressor may contribute to increased incidence of uterine fibroids.

Genkinger JM, Makambi KH, Palmer JR, Rosenberg L, Adams-Campbell LL. Consumption of dairy and meat in relation to breast cancer risk in the Black Women's Health Study. *Cancer Causes Control* 2013;24(4):675-84. doi: 10.1007/s10552-013-0146-8.

Results on the association of meat and dairy intake with the incidence of breast cancer have been conflicting. In the BWHS, neither meat consumption nor dairy consumption was materially related to the incidence of breast cancer. Associations with specific subtypes of breast cancer, such as estrogen receptor positive and negative cancer, were also generally absent.

Felix AS, ..., Wise LA, Palmer JR, Rosenberg, et al. The etiology of uterine sarcomas: a pooled analysis of the Epidemiology of Endometrial Cancer Consortium. *Br J Cancer* 2013;108(3):727-34. doi: 10.1038/bjc.2013.2.

Uterine sarcomas are a rare subtype of endometrial cancer (cancer of the lining of the uterus). To study this rare subtype requires the collaboration of multiple studies in order to have sufficient cases. The BWHS contributed data to such a collaboration, which found that risk factors for uterine sarcomas are no different from those for the most common subtype of this cancer.

Coogan PF, Wise LA, O'Connor GT, Brown TA, Palmer JR, Rosenberg L. Abuse during childhood and adolescence and risk of adult-onset asthma in African American women. *J Allergy Clin Immunol* 2013;131(4):1058-63. doi: 10.1016/j.jaci.2012.10.023.

Childhood abuse has been associated with a higher risk of asthma during childhood. An analysis of BWHS data found an association of asthma incidence during adulthood with both physical and sexual abuse during childhood, with a stronger association for physical abuse. A proposed mechanism involves the effect of stress on the immune system.

Palmer JR, Ruiz-Narváez EA, Rotimi CN, Cupples LA, Cozier YC, Adams-Campbell LL, Rosenberg L. Genetic susceptibility loci for subtypes of breast cancer in an African American population. *Cancer Epidemiol Biomarkers Prev* 2013;22(1):127-34. doi: 10.1158/1055-9965.EPI-12-0769.

Genetic variants identified in populations of European-ancestry women were assessed in the BWHS. Several genetic variants were associated with increased risk of breast cancer, including with the subtypes that are more aggressive and occur more commonly in African American women—the estrogen receptor-negative and triple negative subtypes. These findings contribute to understanding of why certain breast cancer subtypes occur more commonly among Black women.

Ruiz-Narváez EA, Rosenberg L, Yao S, Rotimi CN, Cupples LA, Bandera EV, Ambrosone CB, Adams-Campbell LL, Palmer JR. Fine-mapping of the 6q25 locus identifies a novel SNP associated with breast cancer risk in African American women. *Carcinogenesis* 2013;34(2):287-91. doi: 10.1093/carcin/bgs334.

A specific genetic variant has been associated with increased risk of breast cancer in Chinese women and women of European-ancestry, but not in women of African ancestry. Genotyping in the BWHS indicated that a different genetic variant in the same region as the one found in Chinese and European women is associated with a reduced risk in the BWHS. The finding was confirmed in another study of Black women.

Ruiz-Narváez EA. Use of alternative promoters may hide genetic effects on phenotypic traits. *J Hum Genet* 2013; 58(1):47-50. doi: 10.1038/jhg.2012.115.

Many genetic variants have been identified as being associated with specific diseases, but they explain only a small part of the expected genetic variation and are poor predictors of disease occurrence. This paper proposes a mathematical model involving promoters that suggests new paths of research to understand genetic effects.

Chen F, ..., Palmer JR, Ruiz-Narváez EA, et al. A genome-wide association study of breast cancer in women of African ancestry. *Hum Genet* 2013;132:39-48. doi: 10.1007/s00439-012-1214-y.

Most genetic variants that have been linked to disease occurrence have very small effects, and very large studies are needed to identify them. Multiple studies, including the BWHS, contributed to the present study of genetic risk factors for breast cancer in women of African ancestry. Two previously unidentified genetic variants were found to be associated with breast cancer risk.

Li S, Rosenberg L, Palmer JR, Phillips GS, Heffner LJ, Wise LA. Central adiposity and other anthropometric factors in relation to risk of macrosomia in an African American population. *Obesity* 2013;21(1):178-84. doi: 10.1038/oby.2012.142.

In previous studies, obesity measured by body mass index has been linked to an increased risk of macrosomia (birth weight of at least 4000 grams or of at least 8 pounds 13 ounces). Such babies have a higher risk of injury during the birth and a higher chance of childhood obesity. High waist circumference and high ratio of waist to hip circumference are measures of “central” obesity, in which body fat is more concentrated in the waist than in the hips. In the BWHS, these measures as well as obesity measured by body mass index were all associated with a higher risk of macrosomia.

Phillips GS, Wise LA, Rich-Edwards JW, Stampfer MJ, Rosenberg L. Neighborhood socioeconomic status in relation to preterm birth in a U.S. cohort of Black women. *J Urban Health* 2013;90(2):197-211. doi: 10.1007/s11524-012-9739-x.

Some previous studies that have measured neighborhood socioeconomic status (SES) with a single variable have found associations of SES with higher rates of preterm birth. Neighborhood SES may be better captured with a variable based on multiple factors. Using such a variable in the BWHS, we found little evidence of an association of neighborhood SES with risk of premature birth.

## 2012

Palmer JR, Boggs DA, Wise LA, Adams-Campbell LL, Rosenberg L. Individual and neighborhood socioeconomic status in relation to breast cancer incidence in African American women. *Am J Epidemiol* 2012;176(12):1141-6. doi: 10.1093/aje/kws211.

Some studies have indicated that the incidence of breast cancer is higher among women with higher socioeconomic status and in geographic areas of higher socioeconomic status. Analyses of BWHS data indicated that those associations are artifacts, probably due to differences in reproductive factors, such as age at first birth, that are associated with the most common subtype of breast cancer, estrogen receptor positive cancer.

Wise LA, Ruiz-Narváez EA, Palmer JR, Cozier YC, Tandon A, Patterson N, Radin RG, Rosenberg L, Reich D. African ancestry and genetic risk for uterine leiomyomata. *Am J Epidemiol* 2012;176(12):1159-68. doi: 10.1093/aje/kws276.

DNA from saliva samples provided by BWHS participants was genotyped to identify regions of the genome where the proportion of African or European ancestry was strikingly higher or lower than that seen elsewhere in the genome. This genotyping produced evidence that certain regions of chromosomes 2, 4 and 10 may be involved in the development of fibroids. Further work is needed to specifically identify the genetic variants associated with risk, which probably differ across populations of differing ancestry.

Wise LA, Radin RG, Palmer JR, Rosenberg L. Association of intrauterine and early life factors with uterine leiomyomata in Black women. *Ann Epidemiol* 2012; 22(12):847-54. doi: 10.1016/j.annepidem.2012.09.006.

Some studies have linked early life factors, such as whether a woman was breast fed or was born prematurely, to the incidence in adulthood of uterine fibroids (leiomyomata). BWHS results suggest that intrauterine and other early life factors do not play a major role in the development of uterine fibroids.

Cozier YC, Ruiz-Narváez EA, McKinnon C, Berman J, Rosenberg L, Palmer JR. Fine-mapping in African Americans confirms the importance of the 10p12 and 10q22 loci to sarcoidosis. *Genes Immun* 2012;13(7):573-8. doi: 10:1038/gene.2012.42.

DNA from saliva samples provided by BWHS participants was genotyped to identify genetic variants that might be associated with risk of sarcoidosis. The analyses confirmed that a chromosome 10p12 locus is associated with risk and narrowed the area in which the causal gene is located. Further work must be carried out to identify the exact genetic variants responsible for the association and their functions.

Cozier YC, Berman JS, Palmer JR, Boggs DA, Wise LA, Rosenberg L. Reproductive and hormonal factors in relation to incidence of sarcoidosis in U.S. Black women: the Black Women's Health Study. *Am J Epidemiol* 2012;176(7):635-41. doi: 10.1093/aje/kws145.

Sarcoidosis occurs more frequently among African American women than in other population groups and the causes of the illness are largely unknown. The first study of whether factors related to reproduction might play a role was carried out using BWHS data. Later age at first birth and later age at becoming menopausal were associated with reduced risk. These findings suggest a role for female hormones but they need to be confirmed in further studies.

Boynton-Jarrett R, Rosenberg L, Palmer JR, Boggs DA, Wise LA. Child and adolescent abuse in relation to obesity in adulthood: the Black Women's Health Study. *Pediatrics* 2012;130(2):245-53. doi: 10.1542/peds.2011-1554.

Sexual and physical abuse during childhood were associated with increased risk of overall obesity and central obesity during adulthood among BWHS participants. The association was weakened after "controlling" for health behaviors, reproductive history, and mental health during adulthood, which may have resulted in part from the abuse. These findings add to the increasing evidence that childhood abuse can lead to adult obesity and other adverse health outcomes.

Bosco JLF, Palmer JR, Boggs DA, Hatch EE, Rosenberg L. Cardiometabolic factors and breast cancer risk in U.S. Black women. *Breast Cancer Res Treat* 2012;134(3):1247-56. doi: 10.1007/s10549-012-2131-4.

It has been suggested that “metabolic syndrome”, which is associated with inflammation, may be associated with increased risk of breast cancer. In an assessment of this possibility in the BWHS, women who had three or more markers of metabolic syndrome had a higher incidence of breast cancer than women who had no such markers (the markers were obesity, high blood pressure, diabetes, and high cholesterol levels). This finding supports the hypothesis that inflammation is involved in the occurrence of breast cancer.

Coogan PF, Wise LA, Cozier YC, Palmer JR, Rosenberg L. Lifecourse educational status in relation to weight gain in African American women. *Ethn Dis* 2012;22:198-206.

Children with lower socioeconomic status during childhood tend to gain more weight in adulthood than children from families with higher socioeconomic status. In the BWHS, the risk of becoming obese in adulthood among participants who had graduated from college was the same for those who had high and low socioeconomic status in childhood, indicating that economic disadvantage during childhood can be counteracted by socioeconomic status in adulthood.

Radin RG, Rosenberg L, Palmer JR, Cozier YC, Kumanyika SK, Wise LA. Hypertension and risk of uterine leiomyomata in US Black women. *Hum Reprod* 2012;27(5):1504-9. doi: 10.1093/humrep/des046.

Some studies have found high blood pressure to be associated with increased risk of uterine fibroids (leiomyomata) but results are conflicting. In the BWHS, the association of high blood pressure treated with medications to risk of fibroids differed according to how the fibroids had been diagnosed. These analyses suggest that observed associations of high blood pressure with fibroids reflect the types of medical care that women the received.

Zhang X, ..., Boggs DA, Palmer JR, et al. Carotenoid intakes and risk of breast cancer defined by estrogen receptor and progesterone receptor status: a pooled analysis of 18 prospective cohort studies. *Am J Clin Nutr* 2012;95(3):713-25. doi: 10.3945/ajcn.111.014415.

This large collaborative analysis of data from 18 follow-up studies that included 33,380 breast cancer cases. The analysis assessed the relation of carotenoid intake from fruits and vegetables to the risk of breast cancer classified by estrogen and progesterone receptor status. Intakes of alpha-carotene, beta carotene, and lutein/zeaxanthin were associated with a reduced incidence of estrogen receptor negative breast cancer, but not of estrogen receptor positive breast cancer.

Coogan PF, White LF, Jerrett M, Brook RD, Su JG, Seto E, Burnett R, Palmer JR, Rosenberg L. Air pollution and incidence of hypertension and diabetes in Black women living in Los Angeles. *Circulation* 2012;125:767-72. doi: 10.1161/CIRCULATIONAHA.111.052753.

It is known that spikes in air pollution can increase risk of heart attacks, but whether chronic exposure to air pollution increases the risk of high blood pressure or diabetes is

uncertain. We obtained air pollution data for Los Angeles and found that high levels of nitrogen oxides were associated with small increases in the incidence of both high blood pressure and diabetes in BWHS participants in that area. We are obtaining air pollution data for other areas of the country so that we can assess these relationships among all BWHS participants.

Wise LA, Palmer JR, Cozier YC, Rosenberg L. Hair relaxer use and risk of uterine leiomyomata in African American women. *Am J Epidemiol* 2012;175(5):432-40. doi: 10.1093/aje/kwr351.

Hair relaxer use is widespread and it should be demonstrated to be safe. In the BWHS, long-term users had a slightly higher incidence of uterine fibroids (leiomyomata) than shorter-term users or nonusers. These results raise the hypothesis that hair relaxer use, or something associated with use, may be involved in the development of fibroids. Confirmation in other data, and investigation of factors that may account for the association, is needed.

Coogan PF, White LF, Evans SR, Palmer JR, Rosenberg L. The influence of neighborhood socioeconomic status and walkability on TV viewing time. *J Phys Act Health* 2012;9:1074-9. doi: 2011-0051.

Sitting for many hours a day (sedentary behavior), such as watching T.V., has adverse effects on health. For example, sedentariness is associated with increased weight gain. In a BWHS analysis, whether a neighborhood was conducive to walking had little relationship to hours of T.V. viewing. However, T.V. viewing was lower in neighborhoods of higher socioeconomic status.

## 2011

Haiman CA, ..., Palmer J, Rosenberg L, et al. A common variant at the TERT-CLPTM1L locus is associated with estrogen receptor-negative breast cancer. *Nat Genet* 2011;43(12):1210-4. doi: 10.1038/ng.985.

The incidence of estrogen receptor negative (ER-) breast cancer, an aggressive form of breast cancer, is greater in African American women than in other American women. Research has been devoted to identifying genetic polymorphisms associated with this subtype of breast cancer that could explain the ethnic difference. In a collaborative analysis that included data from several studies, a polymorphism at the TERT-CLPTM1L locus was associated with ER- breast cancer in both African ancestry and European ancestry women.

Wise LA, Radin RG, Palmer JR, Kumanyika SK, Boggs DA, Rosenberg L. Intake of fruit, vegetables, and carotenoids in relation to risk of uterine leiomyomata. *Am J Clin Nutr* 2011;94(6):1620-31. doi: 10.3945/ajcn.111.016600.

Black women have a higher incidence of uterine fibroids (leiomyomata) than women in

other racial/ethnic groups. In an assessment of dietary factors, the incidence of uterine fibroids in BWHS participants was lower in women who had the highest intake of fruits.

Fruits have many good health effects and BWHS data suggest that one of them may be a reduction in the risk of developing fibroids.

Bosco JLF, Palmer JR, Boggs DA, Hatch EE, Rosenberg L. Regular aspirin use and breast cancer risk in U.S. Black women. *Cancer Causes Control* 2011;22:1553-61. doi: 10.1007/s10552-011-9832-6.

The incidence of colon cancer has been lower in regular aspirin users than nonusers in some studies, raising the possibility that aspirin may also be associated with reduced risk of other cancers. We found a lower incidence of breast cancer in BWHS participants who used aspirin regularly than in nonusers, but there was also a lower incidence among women who regularly used drugs containing acetaminophen; there is no accepted mechanism for the latter finding. Results from other studies have been inconsistent and a beneficial effect of aspirin on breast cancer risk remains uncertain.

Boggs DA, Rosenberg L, Cozier YC, Wise LA, Coogan PF, Ruiz-Narváez EA, Palmer JR. General and abdominal obesity and risk of death among Black women. *N Engl J Med* 2011;365:901-8.

Very large studies of white Americans have established that the risk of death increases with increasing levels of body mass index (a combined measure of weight and height that measures overall obesity). It was unclear if this pattern applied to African Americans because the studies carried out had been small and results were inconsistent. Results from the BWHS have now removed the uncertainty. The risk of death in the BWHS increased as body mass index increased, and women who were most obese had the highest risk. There was also evidence of higher risk for women with a large waist circumference (which is a marker of abdominal obesity). The strongest association was with death from heart disease. Weight reduction would be expected to reduce the risk.

Palmer JR, Boggs DA, Wise LA, Ambrosone CB, Adams-Campbell LL, Rosenberg L. Parity and lactation in relation to estrogen receptor negative breast cancer in African American women. *Cancer Epidemiol Biomarkers Prev* 2011;20(9):1883-91. doi: 10.1158/1055-9965.EPI-11-0465.

Not all breast cancers are the same. There are several subtypes, some of which are more aggressive and difficult to treat than others. Estrogen receptor (ER) negative breast cancer is one such aggressive subtype and it occurs more commonly among African American women. We found that BWHS participants with more children had a higher risk of ER-negative breast cancer than participants with fewer children if they had not breastfed. If women had breast fed, there was no increase in risk. These findings suggest that breast feeding may lead to a reduction in the risk of ER-negative breast cancer.

Chen F, Chen GK, Millikan RC, John EM, Ambrosone CB, Bernstein L, Zheng W, Hu JJ, Ziegler RG, Deming SL, Bandera EV, Nyante S, Palmer JR, Rebbeck TR, Ingles SA, Press MF, Rodriguez-Gil JL, Chanock SJ, Le Marchand L, Kolonel LN, Henderson BE, Stram DO, Haiman

CA. Fine-mapping of breast cancer susceptibility loci characterizes genetic risk in African Americans. *Hum Mol Genet* 2011;20(22):4491-503. doi: 10.1093/hmg/ddr367.

Many genetic variants may be associated with breast cancer occurrence, but the increases in risk for most variants are so small that very large studies are needed to identify them. The BWHS collaborated with eight other epidemiologic studies of African American women for this purpose; DNA samples from 3,016 cases of breast cancer and 2,745 comparison women were genotyped. Several new genetic variants were found to be associated with risk of breast cancer. Further work is needed to further refine exactly which genetic variants are involved and to understand their functions.

Ruiz-Narváez EA, Fraser PA, Palmer JR, Cupples LA, Reich D, Wang AY, Rioux JD, Rosenberg L. MHC region and risk of systemic lupus erythematosus in African-American women. *Hum Genet* 2011;130(6):807-15. doi: 10.1007/s00439-011-1045-2.

Systemic lupus erythematosus (lupus) is an auto-immune disease. We assessed genetic variants on an area of a chromosome, the major histocompatibility complex, which has been associated with other auto-immune diseases. Based on 380 cases of lupus and twice as many comparison women unaffected by lupus, we found that three genetic variants that had been identified in studies of Chinese and European-ancestry women were associated with lupus in the BWHS. We also identified four new genetic variants. Investigation of the functions of these genetic variants should shed light on how lupus develops.

Bright-Gbebry M, Makambi KH, Rohan JP, Llanos AA, Rosenberg L, Palmer JR, Adams-Campbell LL. Use of multivitamins, folic acid and herbal supplements among breast cancer survivors: The Black Women's Health Study. *BMC Complement Altern Med* 2011;11:30. doi: 10.1186/1472-6882-11-30.

Vitamins and herbal preparations are widely used. Among BWHS participants who are breast cancer survivors, more than half reported use of a multivitamin and close to 40% had taken at least one herbal supplement. The most commonly used herbals were garlic, ginkgo, and echinacea.

Makambi KH, Agurs-Collins T, Bright-Gbebry M, Rosenberg L, Palmer JR, Adams-Campbell LL. Dietary patterns and the risk of colorectal adenomas: the Black Women's Health Study. *Cancer Epidemiol Biomarkers Prev* 2011;20:818-25. doi: 10.1158/1055-9965.EPI-10-1213.

Colorectal adenomas are noncancerous growths in the colon and rectum that often precede the development of colorectal cancer. Preventing adenomas would result reduced risk of developing cancer. Based on 620 cases of colorectal adenomas among BWHS participants, we found that the risk of colorectal adenoma was lower among women who had a high score for a "prudent" dietary pattern, also known as the vegetable/fruit pattern, than among women with a low score. In addition, the risk was greater in women who had a high score on the "western" food pattern, also known as the meat/fried foods pattern, than among women with a low score. These results are yet another reason to try to increase fruits and



vegetables and reduce meats and fried foods in our diets.

Wise LA, Rosenberg L, Radin RG, Mattox C, Yang EB, Palmer JR, Seddon JM. A prospective study of diabetes, lifestyle factors, and glaucoma in African-American women. *Ann Epidemiol* 2011;21(6):430-9. doi: 10.1016/j.annepidem.2011.03.006.

Glaucoma is a leading cause of blindness worldwide and it occurs more commonly among African Americans. Periodic eye examinations are important because the condition can be treated effectively if caught early. Based on 366 confirmed cases of primary open angle glaucoma in the BWHS, we found that glaucoma occurred more commonly among women with type 2 diabetes and was also associated with alcohol consumption. Among women less than 50 years of age, risk was greater among obese women, drinkers, and smokers. If confirmed, these results indicate that women can reduce their risk of developing glaucoma by weight control and limiting alcohol consumption and smoking.

Ruiz-Narváez EA. What is a functional locus? Understanding the genetic basis of complex phenotypic traits. *Med Hypotheses* 2011;76:638-42. doi: 10.1016/j.mehy.2011.01.019.

Researchers have identified many genes that are associated with increased risk of developing specific diseases. Yet these genes explain only a small part of the variability in disease incidence and they are poor predictors of disease occurrence. This paper proposes a theory that may explain why these genes are poor predictors and describes how the theory can be tested.

Boggs DA, Palmer JR, Spiegelman D, Stampfer MJ, Adams-Campbell LL, Rosenberg L. Dietary patterns and 14-year weight gain in African American women. *Am J Clin Nutr* 2011;94(1):86-94. doi: 10.3945/ajcn.111.013482.

Two patterns of dietary consumption have emerged from analyses of food consumption data provided by BWHS participants -- a vegetable/fruit pattern, which is high in fruits, vegetables, legumes, fish, and whole grains, and a meat/fried foods pattern, which is high in red meat, processed meat, French fries, fried chicken, and added fat. BWHS participants who had a high score for the vegetable/fruit dietary pattern gained less weight during 14 years of follow-up than women who had a low score on that pattern, and women with a high score on the meat/fried foods pattern gained more weight than those with a lower score. Thus, BWHS data indicate that a vegetable/fruit pattern is effective for reducing weight gain.

Wise LA, Rosenberg L, Radin RG, Mattox C, Yang EB, Palmer JR, Seddon JM. A prospective study of diabetes, lifestyle factors, and glaucoma in African-American women. *Ann Epidemiol* 2011;21(6):430-9. doi: 10.1016/j.annepidem.2011.03.006.

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Wise LA, Palmer JR, Boggs DA, Adams-Campbell LL, Rosenberg L. Abuse victimization and risk of breast cancer in the Black Women's Health Study. *Cancer Causes Control* 2011;22(4):659-69. doi: 10.1007/s10552-011-9738-3.

Abuse victimization during childhood and the teenage years reported by BWHS participants was not related to the incidence of breast cancer during follow-up from 1995 to 2009. However, there was a small increase in the incidence of breast cancer among women who reported having been physically abused in adulthood. The BWHS is the very first study to report this association and it requires confirmation in other studies.

Ruiz-Narváez EA, Rosenberg L, Wise LA, Reich D, Palmer JR. Validation of a small set of ancestral informative markers for control of population admixture in African Americans. *Am J Epidemiol* 2011;173(5):587-92. doi: 10.1093/aje/kwq401.

Studies of the genetic causes of a particular disease compare genetic variants in people with the disease ("cases") to those in people without the disease ("controls"). If, for example, variant A of a gene is present in 50% of cases and just 25% of controls, this suggests that the gene could be involved as a cause of the disease. The results of these studies can be biased if the cases and controls have different ancestry unrelated to developing the disease. Based on BWHS data, we showed that genotyping 30 selected genetic variants in cases and controls will allow for avoiding this type of bias.

Coogan PF, White LF, Evans SR, Adler TJ, Hathaway KM, Palmer JR, Rosenberg L. Longitudinal assessment of urban form and weight gain in African-American women. *Am J Prev Med* 2011;40(4):411-8. doi: 10.1016/j.amepre.2010.12.013.

We obtained information on the "urban form" of neighborhoods in New York City, Chicago, and Los Angeles in which BWHS participants lived from 1995-2001. The neighborhoods ranged from auto-oriental sprawling areas in which walking to get to a store or transportation is difficult, to urban areas with many interconnected streets and access to public transportation. We found that women who lived in more urban areas gained less weight than those who lived in more sprawling suburban and rural areas.

Cozier YC, Berman JS, Palmer JR, Boggs DA, Serlin DM, Rosenberg L. Sarcoidosis in Black women in the United States: data from the Black Women's Health Study. *Chest* 2011;139(1):144-50. doi: 10.1378/chest.10-0413.

Sarcoidosis is a systemic granulomatous disorder whose causes are unknown. The illness occurs more frequently among African American women than other Americans. During

follow-up through 2007, 435 BWHS participants reported having been newly diagnosed with sarcoidosis. The diagnosis was confirmed for 96% of the cases for which medical record data were obtained. The site most frequently affected was the lung, and the most commonly used medication was prednisone. Outside of the lung, the most commonly affected sites were the lymph nodes, skin, and eyes. We will continue to identify new cases of sarcoidosis as follow-up continues and will assess risk factors for the illness.

## 2010

Boggs DA, Palmer JR, Wise LA, Spiegelman D, Stampfer MJ, Adams-Campbell LL, Rosenberg L. Fruit and vegetable intake in relation to risk of breast cancer in the Black Women's Health Study. *Am J Epidemiol* 2010;172(11):1268-79. doi: 10.1093/aje/kwq293.

Information on dietary intake provided in 1995 and 2001 was analyzed in relation to the occurrence of breast cancer. The overall incidence of breast cancer was similar in women whose diets were high in fruit and vegetables and those whose diets were low in fruits and vegetables. However, a specific type of aggressive breast cancer, estrogen receptor negative cancer, occurred less frequently in women whose intake of vegetables was high. When specific vegetables were considered, we found that cruciferous vegetables (such as broccoli, collard greens, mustard greens, and cabbage) and carrots were associated with a reduced overall risk of breast cancer.

Boggs DA, Rosenberg L, Ruiz-Narváez E, Palmer JR. Coffee, tea, and alcohol intake in relation to risk of type 2 diabetes in African American women. *Am J Clin Nutr* 2010;92(4):960-6. doi: 10.3945/ajcn.2010.29598.

Many studies have reported that drinking coffee, tea, and alcohol may be associated with reduced risk of type 2 diabetes, but there have been no studies in African American women. We examined the relation of consumption of these drinks to risk of type 2 diabetes in the BWHS, based on dietary intake reported in 1995 and 2001 and on 3,671 newly occurring cases of diabetes. Higher intakes of both caffeinated coffee and alcohol were associated with small reductions in the incidence of diabetes, but decaffeinated coffee and tea were not associated with risk.

Russell CW, Boggs DA, Palmer JR, Rosenberg L. Use of a web-based questionnaire in the Black Women's Health Study. *Am J Epidemiol* 2010;172(11):1286-91. doi: 10.1093/aje/kwq310.

Since 2003, BWHS participants have had the option of completing health surveys on the web rather than completing a paper survey. The cost of developing and processing a returned paper questionnaire is more than that of a returned web questionnaire, primarily due to return postage costs and greater processing time for paper questionnaires. The percentage of BWHS respondents who completed a web questionnaire doubled from 2003 to 2007 from 10% to 20%. Younger participants are more likely to choose the web option, but even participants in their 70's and 80's have completed web questionnaires. Even though the web option has increased greatly in popularity, the paper option is still preferred by most BWHS participants.

Albert MA, Cozier YC, Ridker PM, Palmer JR, Glynn RJ, Rose L, Halevy N, Rosenberg L. Perceptions of race/ethnic discrimination in relation to mortality among Black women: results from the Black Women's Health Study. *Ann Intern Med* 2010;170(10):896-904.

Since racial discrimination is a form of chronic psychological stress that might unfavorably affect health, we examined whether perceived experiences of racism are associated with mortality. Based on 920 deaths that occurred during eight years of follow-up in the BWHS, neither institutionalized racism nor everyday experiences of racism was associated with increased overall mortality. There were also no significant associations of experiences of racism with cancer mortality or cardiovascular disease mortality. While these results give no evidence of an unfavorable effect of perceived racism on mortality, longer follow-up is needed.

Boggs DA, Palmer JR, Stampfer M, Spiegelman D, Adams-Campbell LL, Rosenberg L. Tea and coffee intake in relation to risk of breast cancer in the Black Women's Health Study. *Cancer Causes Control* 2010;21(11):1941-8. doi: 10.1007/s10552-010-9622-6.

Tea and coffee are sources of caffeine and nutrients that may act as antioxidants and affect estrogen metabolism. In an analysis based on 1,268 new cases of breast cancer, we found no overall association for either tea or coffee with risk of breast cancer.

Rosenberg L, Boggs DA, Wise LA, Adams-Campbell LL, Palmer JR. Oral contraceptive use and estrogen/progesterone receptor negative breast cancer among African American women. *Cancer Epidemiol Biomarkers Prev* 2010;19(8):2073-9. doi: 10.1158/1055-9965.EPI-10-0428.

Oral contraceptive formulations have changed over time, making it relevant to assess the effect of more recent formulations on breast cancer risk. Based on follow-up of BWHS participants from 1995 to 2007, oral contraceptive use was associated with increased breast cancer risk: risk increased with increasing duration of use among recent users, with a greater effect for estrogen receptor negative breast cancer (based on 279 cases) than for estrogen receptor positive breast cancer (based on 386 cases). Increases in risk associated with short-term use or use in the past were generally small or absent. These results indicate that oral contraceptive formulations used in recent decades may increase breast cancer risk.

Coogan PF, White LF, Evans SR, Palmer JR, Rosenberg L. Effect of urban form on weight gain and incident obesity. *Am J Epidemiol* 2010;171(Suppl):S109.

Preliminary analyses of data from the BWHS indicate that women who live in areas conducive to walking (those with high housing density) gain less weight and less often become obese than women who live in more sprawling areas.

Bosco JLF, Palmer J, Rosenberg L. Cardiometabolic risk factors and cancer in the Black Women's Health Study. *Am J Epidemiol* 2010;171(Suppl):S64.

Some have suggested that certain risk factors for heart disease, such as high blood pressure and high cholesterol levels, may increase the risk of breast cancer. Analyses of BWHS data will assess that hypothesis.

Radin RG, Rosenberg L, Palmer JR, Cozier YC, Kumanyika SK, Wise LA. Hypertension, uterine leiomyomata, and menorrhagia: results from the Black Women's Health Study (abstract). *Am J Epidemiol* 2010;171(Suppl):S33.

Previous studies have found a positive association between hypertension and risk of uterine fibroids confirmed by hysterectomy. Preliminary analyses of BWHS data suggest that the association may be due to an increased likelihood of diagnosis of fibroids among women with hypertension.

Coogan PF, Cozier YC, Krishnan S, Wise LA, Adams-Campbell LL, Rosenberg L, Palmer JR. Neighborhood socioeconomic status in relation to 10-year weight gain in the Black Women's Health Study. *Obesity (Silver Spring)* 2010;18(10):2064-5. doi: 10.1038/oby.2010.69.

We assessed whether neighborhood socioeconomic status (SES) is associated with weight change in the BWHS. Over a period of 10 years, there was greater weight gain among BWHS participants who lived in neighborhoods with lower SES than among participants in higher SES neighborhoods. Once again, BWHS results suggest the need to make changes in the neighborhoods in which people live if we are to combat the epidemic of weight gain and obesity in the U.S.

Ruiz-Narváez EA, Rosenberg L, Cozier YC, Cupples LA, Adams-Campbell LL, Palmer JR. Polymorphisms in the TOX3/LOC643714 locus and risk of breast cancer in African-American women. *Cancer Epidemiol Biomarkers Prev* 2010;19(5):1320-7. doi: 10.1158/1055-9965.EPI-09-1250.

Based on work carried out largely among women of European ancestry, it is believed that many individual genetic variants, each of which has a small effect, contribute to the risk of developing breast cancer. We studied a variant identified in women of European ancestry as being associated with higher breast cancer risk and found a similar association in the BWHS. By genotyping 60 genetic variants throughout that genetic region, we were able to narrow down the position of the genetic variant involved.

Formica MK, McAlindon TE, Lash TL, Demissie S, Rosenberg L. Validity of self-reported rheumatoid arthritis in a large cohort: results from the Black Women's Health Study. *Arthritis Care Res* 2010;62(2):235-41.

Rheumatoid arthritis is a chronic inflammatory disease whose causes are largely unknown. Large studies that could advance knowledge of causes, such as the BWHS, rely on self-reported diagnosis information. We found that the self-reports of women who reported a diagnosis of rheumatoid arthritis together with use of medications specifically prescribed for symptoms of rheumatoid arthritis (such as methotrexate) were sufficiently accurate to allow for study of causes of the disease in the BWHS.

Krishnan S, Cozier YC, Rosenberg L, Palmer JR. Socioeconomic status and incidence of type 2 diabetes: results from the Black Women's Health Study. *Am J Epidemiol* 2010;171(5):564-70. doi: 10.1093/aje/kwp443.

The relation of individual level of socioeconomic status (SES) and of neighborhood level SES to the occurrence of diabetes in the BWHS was assessed, based on more than 3800 new cases of diabetes that developed during 12 years of follow-up. Diabetes occurred more often among women who lived in the most disadvantaged neighborhoods compared to women who lived in neighborhoods of high SES, even among women who had high incomes. This result suggests that efforts to reduce the rate of diabetes in African American women need to consider structural changes to disadvantaged neighborhoods.

Mouton CP, Carter-Nolan PL, Makambi KH, Taylor TR, Palmer JR, Rosenberg L, Adams-Campbell LL. Impact of perceived racial discrimination on health screening in Black women. *J Health Care Poor Underserved* 2010;21(1):287-300. NIHMSID: NIHMS209351.

Perceived discrimination has been associated with health screening behavior in some populations. We assessed whether experiences of discrimination, as reported by BWHS participants in 1997, are associated with having had Pap smears, mammography, or colonoscopy. Both everyday discrimination and discrimination on the job, in housing, or by police were associated with not having received a Pap smear. There was no relation between discrimination and mammography or colonoscopy use.

Radin RG, Palmer JR, Rosenberg L, Kumanyika SK, Wise LA. Dietary glycemic index and load in relation to risk of uterine leiomyomata in the Black Women's Health Study. *Am J Clin Nutr* 2010;91(5):1281-8. doi: 10.3945/ajcn.2009.28698.

To determine whether foods high in carbohydrates increase the risk of uterine fibroids, we conducted the first study of dietary glycemic index (GI) and glycemic load (GL) in relation to the occurrence of uterine fibroids. GI and GL are measures of the effects of carbohydrates on blood sugar levels. Carbohydrates that break down quickly during digestion and release glucose rapidly into the blood stream have a high GI (for example, white bread), while carbohydrates that break down slowly and release glucose more gradually have a low GI (for example, whole wheat bread). Based on 5800 cases of fibroids that occurred through 2007 among BWHS participants, women with high intake of foods with a high GI were slightly more likely than women with low intakes to develop fibroids. If confirmed in other studies, the finding will provide leads as to the mechanism of fibroid formation.

Wise LA, Palmer JR, Heffner LJ, Rosenberg L. Prepregnancy body size, gestational weight gain, and risk of preterm birth in African-American women. *Epidemiology* 2010;21(2):243-52. doi: 10.1097/EDE.0b013e3181cb61a9.

The U.S. Institute of Medicine recently issued new guidelines for weight gain during pregnancy in order to reduce the chance of a baby being born preterm (before the 37th week of pregnancy). We studied body size and weight gain during pregnancy in relation

to preterm birth in the BWHS, based on 7,840 reported births. We found that women with weight gains during pregnancy in the ranges recommended by the Institute of Medicine had fewer preterm births than women with gains below or above the recommendations. This was especially true for women who were obese: among them, preterm births occurred more than twice as often if the pregnancy weight gain was below or above the recommended amount. Pregnant women should confer with their doctors so that they can aim at the best amount of weight to gain during their pregnancies.

Ruiz-Narváez EA, Rosenberg L, Rotimi C, Cupples LA, Boggs DA, Adeyemo A, Cozier YC, Adams-Campbell LL, Palmer JR. Genetic variants on chromosome 5p12 are associated with risk of breast cancer in African American women: the Black Women's Health Study. *Breast Cancer Res Treat* 2010;123(2):525-30. doi: 10.1007/s10549-010-0775-5. PMID: PMC3208423.

A few “breast cancer genes” have been discovered that put women at greatly increased risk, but the vast majority of women do not have these genes. The search is on for other genes that may confer small increases or decreases in breast cancer risk. Based on DNA from saliva-mouthwash samples provided by BWHS participants, several genetic variants were found to be associated with small increases in risk in the BWHS. The results require confirmation.

Adams-Campbell LL, Makambi K, Mouton CP, Palmer JR, Rosenberg L. Colonoscopy utilization in the Black Women’s Health Study. *J Natl Med Assoc* 2010;102(3):1-6.

Mortality rates from colorectal cancer are higher among African Americans than other Americans. Screening by colonoscopy picks up early disease and results in reduced mortality rates. (During a colonoscopy, a flexible tube is inserted into the large intestine, which allows the doctor to see if there are polyps and remove them). In the BWHS, the strongest correlate of colonoscopy use was having used mammography screening. This suggests that concurrent promotion of mammography and colonoscopies may be a good approach to increasing the use of colonoscopies among women. The current recommendation is that people at average risk of colorectal cancer have a colonoscopy beginning at age 50.

Krishnan S, Coogan PF, Boggs DA, Rosenberg L, Palmer JR. Consumption of restaurant foods and incidence of type 2 diabetes in African American women. *Am J Clin Nutr* 2010;91(2):465-71. doi: 10.3945/ajcn.2009.28682.

Based on food intake information provided by BWHS participants in 1995 and 2001 and on 2873 new cases of diabetes that developed among BWHS participants during 1995-2005, women who frequently consumed restaurant meals of hamburgers, fried chicken, fried fish or Chinese food were found to have a higher risk of developing diabetes. The increases in risk were greater for burgers and fried chicken. Analyses suggested that the increase in diabetes risk was mostly due to weight gain. Because consumption of “fast foods” like burgers and fried chicken from restaurants is associated with higher intake of fats and sugar sweetened drinks, which are associated with increased risk of diabetes, decreases in consumption of this type of meal are desirable.

Phillips GS, Wise LA, Rich-Edwards JW, Stampfer MJ, Rosenberg L. Prepregnancy depressive symptoms and preterm birth in the Black Women's Health Study. *Ann Epidemiol* 2010;21(1):8-15. doi: 10.1016/j.annepidem.2009.09.009.

We studied depressive symptoms occurring before pregnancy in relation to preterm birth in the BWHS. Symptoms were measured by responses on the 1999 health survey to the 20 questions of the CES-D scale. Very high levels of depressive symptoms were associated with a higher risk of spontaneous preterm birth. There have been few studies of this issue and the results require confirmation.

Wise LA, Radin RG, Palmer JR, Kumanyika SK, Rosenberg L. A prospective study of dairy intake and risk of uterine leiomyomata. *Am J Epidemiol* 2010;171(2):221-32. doi: 10.1093/aje/kwp355.

Calcium and other components in dairy foods can reduce cell growth. To test whether this is the case for uterine fibroids (growths in the womb), we analyzed information on food intake from the 1995 and 2001 surveys in relation to the risk of fibroids, which occurred among more than 5,800 BWHS participants during 1995-2007. Women who ate the most milk, cheese, and other dairy products were less likely to develop fibroids than women who ate the least. This new results needs to be confirmed in other studies.

## 2009

Boggs DA, Wise LA, Rosenberg L, Adams-Campbell LL, Palmer JR. Fruit and vegetable intake in relation to risk of breast cancer in the Black Women's Health Study (abstract). In: Proceedings of the 100th Annual Meeting of the American Association for Cancer Research. Denver, CO. 2009. Philadelphia: AACR, 2009: Abstract #64.

Fruits and vegetables are sources of many nutrients that may help protect against cancer. Results based on 1,268 new cases of breast cancer show that eating at least 2 vegetables per day was associated with significantly lower risk of hormone receptor-negative breast cancer compared with consumption of fewer than 4 vegetables per week. We also found evidence suggesting that certain types of vegetables, particularly cruciferous vegetables and carrots, are associated with lower risk of all types of breast cancer.

Coogan PF, White LF, Adler TJ, Hathaway KM, Palmer JR, Rosenberg L. Prospective study of urban form and physical activity in the Black Women's Health Study. *Am J Epidemiol* 2009;170(9):1105-17. doi: 10.1093/aje/kwp264.

We obtained information on the "urban form" (for example, amount of sidewalks, distance to public transportation) of neighborhoods of BWHS participants living in New York City, Chicago, and Los Angeles during 1995-2001 and studied whether urban form was related to the amount of walking (to work, shopping, and church) reported by these women. The neighborhood characteristic that was most associated with walking was the



“density” of the neighborhood—dense neighborhoods tend to have networks of sidewalks and to have public transportation that people can walk to. This information is important for city planners so that neighborhoods can be designed to encourage healthy activities such as walking.

Palmer JR, Boggs DA, Adams-Campbell LL, Rosenberg L. Family history of cancer and risk of breast cancer in the Black Women’s Health Study. *Cancer Causes Control* 2009;20:1733-7. doi: 10.1007/s10552-009-9425-9.

In 1995, and then again in 1999, BWHS participants reported information on the occurrence of various illnesses in their parents, sisters and brothers, and daughters and sons, including family history of breast cancer. Our analyses of BWHS data found that women who had a mother, sister, or daughter with breast cancer were almost two times as likely to develop breast cancer as women who had no relatives with breast cancer. The National Cancer Institute recommends a mammogram every year or two starting at age 40 and suggests that women with a family history of breast cancer consult with their doctors about earlier or more frequent screening.

Phillips GS, Wise LA, Rich-Edwards J, Stampfer M, Rosenberg L. Income incongruity, relative household income, and preterm birth in the Black Women’s Health Study. *Soc Sci Med* 2009;68(12):2122-8. doi: 10.1016/j.socscimed.2009.03.039.

It has been suggested that “relative” income (a person’s income compared to that of similar people living in the same area or neighborhood) may be a better predictor of health outcomes than the actual amount of income. We studied relative income in relation to preterm birth in the BWHS and found no clear overall associations of measures of relative income with the occurrence of preterm birth.

Min C, Yu Z, Kirsch KH, Zhao Y, Vora SR, Trackman PC, Spicer DB, Rosenberg L, Palmer JR, Sonenshein GE. A loss-of-function polymorphism in the propeptide domain of the LOX gene and breast cancer. *Cancer Res* 2009;69(16):6685-93. doi: 10.1158/0008-5472.CAN-08-4818.

The LOX gene is involved in suppressing the growth of tumors. Using DNA from saliva samples provided by BWHS participants, we found that women with a particular genetic variant in the LOX gene had a higher risk of estrogen receptor-negative breast cancer than women who did not have that variant. These results suggest that reduced ability to inhibit tumor formation is involved in breast cancer development.

Agurs-Collins T, Rosenberg L, Makambi K, Palmer JR, Adams-Campbell L. Dietary patterns and breast cancer risk in women participating in the Black Women’s Health Study. *Am J Clin Nutr* 2009;90(3):621-8. doi: 10.3945/ajcn.2009.27666.

We studied dietary patterns in relation to breast cancer risk using information on food intake that BWHS participants reported in 1995 and 2001, and breast cancer occurrences between 1995 and 2007. The “prudent” dietary pattern, characterized by greater intake of fruits, vegetables, fish, and whole grains, was associated with a lower risk of breast

cancer, including estrogen receptor-negative breast cancer. The next step will be to determine which constituents of the prudent dietary pattern are most responsible for the reduction in risk.

Makambi KH, Williams CD, Taylor TR, Rosenberg L, Adams-Campbell LL. An assessment of the CES-D scale factor structure in Black women: the Black Women's Health Study. *Psychiatry Res* 2009;168(2):163-70. doi: 10.1016/j.psychres.2008.04.022.

To study the health effects of depression requires a valid measure of depressive symptoms. In 1999 BWHS participants completed the CES-D scale, which is twenty questions about how often the person experienced certain feelings, such as feeling fearful. Our analysis of BWHS data indicated that the scale is an appropriate measure of depressive symptoms among Black women.

Cozier YC, Wise LA, Palmer JR, Rosenberg L. Perceived racism in relation to weight change in the Black Women's Health Study. *Ann Epidemiol* 2009;19:379-87. doi: 10.1016/j.annepidem.2009.01.008.

In an assessment of weight change between 1997 and 2005 among BWHS participants, we found that women who reported frequent experiences of racism gained more weight than women who reported that they rarely or never experienced racism. These results suggest that experiences of racism may contribute to the occurrence of overweight and obesity among African American women.

Wise LA, Palmer JR, Rothman EF, Rosenberg L. Childhood abuse and early menarche: findings from the Black Women's Health Study. *Am J Public Health* 2009;99(Suppl. 2):S640-6. doi: 10.2105/AJPH.2008.149005.

In the BWHS, approximately 50% of participants reported having been subjected to childhood abuse. We found that a higher proportion of women who reported sexual abuse during childhood started menstruating at an early age than women who reported no abuse. There was a weak association of age at start of menstruation with physical abuse during childhood. Because the age at which a girl's periods start is a predictor of various health outcomes later in life, an effect of childhood abuse on the age of onset is important.

Coogan PF, Palmer JR, O'Connor G, Rosenberg L. Body mass index and asthma incidence in the Black Women's Health Study. *J Allergy Clin Immunol* 2009;123(1):89-95. doi: 10.1016/j.jaci.2008.09.040.

Studies of white women suggest that obesity is associated with increased occurrence of new-onset asthma. We found this to be so in the BWHS as well. There were 1,068 women who reported newly-occurring asthma together with medications for asthma. The occurrence of asthma increased with as body mass index increased: the risk was 2.85 times greater among women with a body mass index of 40 than in women with a body mass index of 20-24, which is the recommended body mass index for good health.

Krishnan S, Rosenberg L, Palmer JR. Physical activity and television watching in relation to risk of type 2 diabetes: the Black Women's Health Study. *Am J Epidemiol* 2009;169(4):428-34. doi: 10.1093/aje/kwn344.

Based on 2,928 newly-diagnosed cases of diabetes in the BWHS, we found that the incidence of the disease was reduced among women who participated in vigorous physical activity compared with inactive women, in agreement with many studies of white women. In addition, brisk walking was also associated with reduce risk of diabetes in the BWHS-this is good news because it may be possible for many women to fit brisk walking into a busy schedule. On the other hand, risk of diabetes was increased among women who spent five or more hours a day watching television, regardless of their physical activity. Women who do not wish to cut down on their TV viewing should consider limiting the snacks that often go along with TV watching.

## 2008

Thun MJ, Hannan LM, Adams-Campbell LL, Boffetta P, Buring JE, Feskanich D, Flanders WD, Jee SH, Katanoda K, Kolonel LN, Lee IM, Marugame T, Palmer JR, Riboli E, Sobue T, Avila-Tang E, Wilkens LR, Samet JM. Lung cancer occurrence in never-smokers: an analysis of 13 cohorts and 22 cancer registry studies. *PLoS Med* 2008;5(9):e185. doi: 10.1371/journal.pmed.0050185.

The BWHS contributed data to an analysis of lung cancer among women and men who had never smoked. The analysis was based on data from 13 large follow-up studies and on information from cancer registries. Among people who had never smoked, the death rate from lung cancer was higher in men than in women and higher in African Americans than in whites. The causes remain to be determined.

Palmer JR, Boggs DA, Krishnan S, Hu FB, Singer M, Rosenberg L. Sugar-sweetened beverages and incidence of type 2 diabetes mellitus in African American women. *Arch Intern Med* 2008;168(14):1487-92.

Type 2 ("adult onset") diabetes is a serious and common health problem for African American women. In an analysis based on 2,713 newly-diagnosed cases of diabetes in the BWHS, we found that the risk of developing diabetes was 30% greater in women who drank two or more sugar-sweetened soft drinks of sugar-sweetened fruit drinks per day than in women who rarely drank these drinks. There is increasing public awareness of the adverse health effects of soft drinks but little attention has been given to sugar-sweetened fruit drinks, which are often marketed as a healthy alternative.

Rosenberg L, Boggs DA, Palmer JR, Adams-Campbell LL. Meat, fat, and dairy intake in relation to breast cancer incidence in the Black Women's Health Study (abstract). *Am J Epidemiol* 2008;167(Suppl):S360.

Meat and animal fat consumption have been associated with increased risk of breast cancer in some studies. Based on BWHS data, we found little evidence for an association of intake of red meat, total fat, saturated fat, or dairy products with the overall incidence of breast cancer. There were some associations with a subtype of breast cancer called estrogen receptor negative cancer, but these were based on small numbers and need to be confirmed with a larger sample.

Palmer JR, Boggs DA, Adams-Campbell LL, Rosenberg L. Glycemic index, sweets, and breast cancer risk in the Black Women's Health Study (abstract). *Am J Epidemiol* 2008;167(Suppl):S235.

Studies of diet and breast cancer have given conflicting results on whether intake of foods high in sugar increases breast cancer risk. In our study based on 1,091 cases of breast cancer in the BWHS, there was weak evidence of an association. Women who ate at least one sweet a week had a higher risk of developing breast cancer than women who ate few sweets but there was not a trend of increasing risk with increasing sweet consumption.

Wise LA, Palmer JR, Heffner LJ, Rosenberg L. Maternal anthropometric risk factors for preterm birth in the Black Women's Health Study (abstract). *Am J Epidemiol* 2008;167(Suppl):S79.

Based on information given by BWHS participants on 7,324 births, we found that the risk of spontaneous preterm birth was increased among women who were thin (body mass index less than 20) or obese (body mass index of 30 or more) before the pregnancy, compared with women who had a body mass index of 20-24.

Krishnan S, Rosenberg L, Palmer JR. Fast food consumption and risk of type 2 diabetes in the Black Women's Health Study (abstract). *Am J Epidemiol* 2008;167(Suppl):S313.

We found that frequent consumption of food from restaurants was associated with increased incidence of diabetes, based on 2,846 newly occurring cases. Fast food consumption has increased greatly in the U.S. in recent years, and it is likely that a large proportion of these restaurant meals were from fast food restaurants.

Coogan PF, White LF, Palmer JR, Rosenberg L. The influence of urban form on walking in the Black Women's Health Study (abstract). *Am J Epidemiol* 2008;167(Suppl):S409.

For three cities, Los Angeles, Chicago, and New York, we obtained detailed data on "urban form", such as the presence of sidewalks and the distance to bus stops. We found that BWHS participants in those cities who lived in pedestrian-friendly neighborhoods spent more time walking for transport (to work, shops, church, etc) than women in less pedestrian-friendly neighborhoods. Results such as these are important for persuading city planners to ensure that neighborhoods are constructed to be pedestrian-friendly.

Coogan PF, Palmer JR, O'Connor GT, Rosenberg L. The relation of body mass index to asthma incidence in the Black Women's Health Study (abstract). *Am J Epidemiol* 2008;167(Suppl):S120.

We found that the occurrence of newly-diagnosed asthma increased with increasing weight, and women with a body mass index of 40 or more had almost three times the risk of asthma as women with a body mass index of 20-24.

Boggs DA, Palmer JR, Adams-Campbell LL, Rosenberg L. Change in diet patterns in relation to weight gain in the Black Women's Health Study (abstract). *Am J Epidemiol* 2008;167(Suppl):S398.

We examined changes in dietary patterns in relation to weight gain, based on food intake information that BWHS participants provided in 1995 and 2001. Two diet patterns, "prudent" (high in fruits and vegetables) and "western" (high in meat and high-fat dairy) were assessed. Decreased intake of a prudent diet and increased intake of a western diet were associated with more weight gain.

Cozier YC, Albert MA, Palmer JR, Rosenberg L. Neighborhood socioeconomic status in relation to serum biomarkers in the Black Women's Health Study (abstract). *Am J Epidemiol* 2008;167(Suppl):S520.

We examined the relation between neighborhood socioeconomic status and certain markers in the blood that are thought to be predictors of heart disease. Based on blood samples given by 486 BWHS participants, we found that women living in the most disadvantaged neighborhoods had the least favorable levels of HDL cholesterol, triglycerides, and C-reactive protein.

Wise LA, Rosenberg L, Palmer JR, Adams-Campbell LL. Anthropometric risk factors for colorectal polyps in African-American women. *Obesity* 2008;16(4):859-68.

In a study based on 1,189 newly occurring cases, we found that BWHS participants who were obese or who had gained a great deal of weight during adulthood were at increased risk of developing polyps in the colon or rectum. In future studies, we will assess the type of polyp affected, because a certain type of polyps, adenomatous polyps, is thought to be a predictor of the occurrence of colorectal cancer.

## **2007**

Palmer JR, Adams-Campbell LL, Boggs DA, Rosenberg L. Familial breast cancer in a cohort of 59,000 African-American women: The Black Women's Health Study (abstract). In: American Association for Cancer Research Annual Meeting. Proceedings. Los Angeles, CA. 2007. Philadelphia: AACR, 2007: Abstract #2500.

The occurrence of breast cancer in the BWHS was greater among women who have a mother or sister with breast cancer than among women whose relatives have not been affected by breast cancer. The risk of breast cancer was greatest for women whose relative had the breast cancer at a young age.

Krishnan S, Rosenberg L, Singer M, Hu FB, Djoussé L, Cupples LA, Palmer JR. Glycemic index, glycemic load, and cereal fiber intake and risk of type 2 diabetes in U.S. Black women. *Arch Intern Med* 2007;167(21):2304-9.

We studied several aspects of the diet — glycemic load, glycemic index, and cereal fiber content — in relation to the occurrence of type 2 (adult onset) diabetes in the BWHS. Glycemic load and index are measures of the type or carbohydrate in the diet. The analysis was based on 8 years of follow-up of BWHS participants, during which time 1,938 participants reported that they had been diagnosed with diabetes. We found that women whose dietary intake had a high glycemic index were at higher risk of diabetes, and women whose diet was high in cereal fiber had a reduced risk. The importance of the findings is that women can reduce their risk of diabetes by making changes in their diet — that is, by increasing the amount of cereal fiber in their diets. The way to do this is to substitute unprocessed foods for processed foods—for example, eat whole wheat bread instead of white bread, shredded wheat instead of corn Chex, and brown rice instead of white rice. The January 2008 BWHS newsletter gives the cereal fiber content of a number of commonly eaten foods.

Wise LA, Palmer JR, Cozier YC, Hunt MO, Stewart EA, Rosenberg L. Perceived racial discrimination and risk of uterine leiomyomata. *Epidemiology* 2007;18(6):747-57.

Uterine fibroids (fibroids in the womb) occur 2-3 times more commonly in Black women than in white women and the reasons for the difference are unknown. We studied whether experiences of racism, reported on the 1997 BWHS health survey, were related to the development of uterine fibroids. The analysis was based on 22,000 premenopausal participants followed in the BWHS from 1997 through 2003. During that time period 3,440 women reported having been diagnosed with uterine fibroids. We found that the condition occurred more often in BWHS participants who reported higher levels of racial discrimination than in those who reported lower levels. There was a suggestion in the data that the increased occurrence of fibroids among women who experienced racism might be smaller or absent among those who had skills for coping with stress, such as getting support from friends or family. This is the first study to suggest that racism may contribute to an increased occurrence of uterine fibroids.

Hunt MO, Wise LA, Jipguep MC, Cozier YC, Rosenberg L. Neighborhood racial composition and perceptions of racial discrimination: evidence from the Black Women's Health Study. *Soc Psychol Q* 2007;70(3):272-89.

On the 1997 BWHS health survey, participants provided information on how often they experienced racial discrimination in everyday life and on the job, in housing, and by police. We obtained information on the racial composition of their neighborhoods from the U.S. Census Bureau and then studied how the racial composition of participants' neighborhoods was related to their experiences of racism. Women in neighborhoods with the highest percent of Black residents reported the least discrimination, while women in more mixed neighborhoods reported intermediate amounts of racism and women in neighborhoods with the lowest percent of Black residents reported the most

discrimination. While racial integration can have social and economic benefits, these results indicate that there is a price to pay in terms of racial discrimination.

Palmer JR, Adams-Campbell LL, Boggs DA, Wise LA, Rosenberg L. A prospective study of body size and breast cancer in Black women. *Cancer Epidemiol Biomarkers Prev* 2007;16(9):1795-802.

In an assessment of body size in relation to the occurrence of breast cancer, based on 1062 newly diagnosed breast cancers in the BWHS, women who were overweight at age 18 had a lower incidence of breast cancer than women who were thin. The mechanism for such an association is unclear. On the other hand, the results suggested that postmenopausal women who were currently obese had a higher risk of breast cancer that was estrogen receptor positive than thinner women; this might be because fatty tissue is the major source of estrogenic hormones after the menopause. The relation of body size to breast cancer risk is complex and requires further study.

Krishnan S, Rosenberg L, Djousse L, Cupples LA, Palmer JR. Overall and central obesity and risk of type 2 diabetes in U.S. Black women. *Obesity* 2007;15(7):1860-6.

The occurrence of type 2 diabetes (adult onset) has increased in the U.S. as has the proportion of women who are overweight or obese (body mass index  $\geq 30$ ). During 8 years of follow-up of BWHS participants, 2,472 new occurrences of type 2 diabetes were reported. The incidence of type 2 diabetes was more than 20 times greater in women in the highest category of body mass index considered ( $\geq 45$ ) than among lean women. A reduction in weight would lead to a reduction in the risk of developing diabetes.

Palmer JR, Krishnan S, Wise LA, Adams-Campbell LL, Rosenberg L. Neighborhood socioeconomic characteristics and weight gain in U.S. Black women (abstract). *Am J Epidemiol* 2007;165:S76.

Understanding the determinants of adult weight gain may lead to more effective interventions. Our preliminary results suggest that adverse neighborhood characteristics contribute to weight gain over and above personal characteristics.

Boggs DA, Palmer JR, McAlindon T, Wise LA, Formica M, Fraser PA, Rosenberg L. Reproductive factors and risk of systemic lupus erythematosus in African-American women (abstract). *Am J Epidemiol* 2007;165:S28.

Lupus (systemic lupus erythematosus) occurs more often in women than men, suggesting that female hormones may be involved. In the BWHS, we found positive associations of lupus with earlier age at starting to menstruate, shorter time between menstrual cycles, and use of postmenopausal female hormone supplements.

Wise LA, Palmer JR, Rosenberg L. Childhood violence victimization and age at menarche in the Black Women's Health Study (abstract). *Am J Epidemiol* 2007;165:S24.

Abuse suffered during childhood has been associated with earlier age at starting to menstruate. In the BWHS, women who reported sexual abuse during childhood began to menstruate earlier than those who did not experience abuse during childhood.

Rosenberg L, Boggs D, Palmer JR, Adams-Campbell LL. The influence of life-style factors on mortality in the Black Women's Health Study (abstract). *Am J Epidemiol* 2007;165:S84.

Mortality rates from many causes are higher in African-American women than white women. Our preliminary analyses show that mortality is increased in women who smoke and drink heavily, and it is decreased in women who exercise vigorously.

Krishnan S, Rosenberg L, Palmer JR. Physical activity and risk of type 2 diabetes in U.S. Black women (abstract). *Am J Epidemiol* 2007;165:S13.

Type 2 (adult onset) diabetes is a serious problem among African American women. Our preliminary analyses show that the incidence of type 2 diabetes is lower among women who exercise vigorously than among women who do not.

Cozier YC, Albert MA, Palmer JR, Rosenberg L. Relation between neighborhood socioeconomic characteristics and mortality in U.S. Black women (abstract). *Am J Epidemiol* 2007;165:S78.

Significant racial differences in mortality exist in the U.S. In preliminary analyses, we found that the risk of dying among BWHS participants who lived in disadvantaged neighborhoods was slightly higher than the risk among women who lived in wealthier neighborhoods after taking into account personal factors and habits, such as education and smoking.

Costa MV, Cozier YC, Rosenberg L, Palmer JR. Response to cheek cell collection in the Black Women's Health Study (abstract). *Am J Epidemiol* 2007;165:S65.

More than 26,000 BWHS participants have provided mouthwash samples. The response rate was greater among women who were asked to swish once than among women who were asked to swish twice, but both rates were high.

Cozier YC, Wise LA, Palmer JR, Rosenberg L. The association between experiences and perceptions of racism and cumulative weight gain in U.S. Black women (abstract). *Am J Epidemiol* 2007;165:S78.

Experiences of racism may affect various aspects of health. In preliminary analyses, we found that women who reported frequent experiences of racism in 1997 gained more weight in the following 8 years than women who reported fewer experiences.

Wise LA, Palmer JR, Poser CM, Ronthal M, Rosenberg L. Geographic variation of MS incidence in the Black Women's Health Study (abstract). *Am J Epidemiol* 2007;165:S68.



In preliminary analyses, the incidence of multiple sclerosis (MS) in the BWHS is higher in northern regions than in southern regions, based on 149 new diagnoses of MS reported by BWHS participants from 1995 to 2005. This finding is in agreement with observations made in other racial/ethnic groups.

Adams-Campbell LL, Makambi KH, Palmer JR, Rosenberg L. Diagnostic accuracy of the Gail model in the Black Women's Health Study. *Breast J* 2007;13:332-6.

The Gail model is a formula used to predict a woman's risk of developing breast cancer, based on her age and several characteristics, such as the age of beginning to menstruate. The model is used to determine whether women are eligible to enter treatment trials for breast cancer. Our analysis of BWHS data shows that the Gail model and a modification derived for African American women have poor accuracy. Better models need to be developed for use among Black women.

Cozier Y, Palmer J, Rosenberg L, Serlin DM, Berman JS. Frequency and characteristics of sarcoidosis in African American women: the Black Women's Health Study (BWHS) (abstract). *Am J Respir Crit Care Med* 2007;175:A361.

Sarcoidosis is an illness that affects African American women more than other women. The causes are largely unknown. The BWHS has begun to study this illness, and a comparison of medical records with reports of the illness by BWHS participants shows a high level of accuracy of reporting by participants.

Rosenberg L, Boggs DA, Adams-Campbell LL, Palmer JR. Hair relaxers not associated with breast cancer risk: evidence from the Black Women's Health Study. *Cancer Epidemiol Biomarkers Prev* 2007;16(5):1035-7.

Hair relaxers have been used by millions of African American women, often at young ages and for many years. Because these products may contain unknown harmful ingredients, we studied their use in relation to the occurrence of breast cancer. Based on information provided on relaxer use on the 1997 BWHS health survey and follow-up through 2003, we found no increases in breast cancer incidence among users, regardless of the length of use, the intensity of use, or the age at starting use. These findings indicate that hair relaxer use does not affect the risk of developing breast cancer.

Wise LA, Palmer JR, Stewart EA, Rosenberg L. Polycystic ovary syndrome and uterine leiomyomata. *Fertil Steril* 2007;87:1108-15.

The relation of polycystic ovary syndrome (PCOS) to risk of uterine fibroids was examined using data collected through 2003. 275 women reported having been newly diagnosed with PCOS and 3,631 reported a new diagnosis of fibroids. The incidence of fibroids was higher among women with PCOS than among women without that condition. This finding, which has biologic plausibility, is new and requires confirmation.

Williams CD, Taylor TR, Makambi K, Harrell J, Palmer JR, Rosenberg L, Adams-Campbell LL. CES-D four-factor structure is confirmed, but not invariant, in a large cohort of African American women. *Psychiatry Res* 2007;150:173-80.

The CES-D is a set of 20 questions used to measure symptoms of depression. It has been used in various population studies to determine whether depression is associated with various illnesses. BWHS participants completed the CES-D scale on the 1999 BWHS health survey. Our analyses indicate that the CES-D scale is appropriate for use in African-American women. A previous study has already found, with use of the CES-D, that BWHS participants who exercise have fewer symptoms of depression than participants who are inactive.

Taylor TR, Williams CD, Makambi KH, Mouton C, Harrell JP, Cozier Y, Palmer JR, Rosenberg L, Adams-Campbell AA. Racial discrimination and breast cancer incidence in U.S. Black women: the Black Women's Health Study. *Am J Epidemiol* 2007;166(1):46-54.

Experiences of racism could affect health adversely. We assessed the relation between experiences of racism reported on the 1997 BWHS health survey to the occurrence of breast cancer in the following 6 years. The incidence of breast cancer was higher among women who reported more everyday and major (in the workplace, in housing, and by police) experiences of racism. The increase in breast cancer incidence among women who reported discrimination in the workplace was statistically significant, and the associations were stronger among women under age 50. This is the first study to find racism to be associated with an increased risk of breast cancer and the results require confirmation.

Cozier YC, Palmer JR, Horton NJ, Fredman L, Wise LA, Rosenberg L. Relation between neighborhood median housing value and hypertension risk among Black women in the United States. *Am J Public Health* 2007;97(4):718-24.

High blood pressure affects many African American women. It is well established that personal factors, like lack of exercise and overweight, are associated with increased risk. We studied whether characteristics of the neighborhoods in which women live affect the risk of high blood pressure.

## **2006**

Van Dam RM, Hu FB, Rosenberg L, Krishnan S, Palmer JR. Dietary calcium and magnesium, major food sources, and risk of type-2 diabetes in U.S. Black women. *Diabetes Care* 2006;29(10):2238-43.

Studies in white populations indicate that dietary magnesium may reduce the risk of developing type 2 (adult onset) diabetes. We assessed this possibility in the BWHS. Based on 1,964 women who reported having been newly diagnosed with the illness

during 1995-2003 and using dietary information reported by participants on the 1995 questionnaire, we found that higher levels of magnesium, low-fat dairy, and whole grains were all associated with a reduced risk of diabetes. These findings suggest that diets high in magnesium-rich foods, particularly whole grains, lower the risk of diabetes in U.S. Black women. This is important because it is possible to increase whole grain intake in the diet by simple measures, such as substituting whole grain bread for white bread or whole grain cereal for other cereals.

Carter-Nolan PL, Adams-Campbell LL, Makambi K, Lewis S, Palmer JR, Rosenberg L. Validation of physical activity instruments: Black Women's Health Study. *Ethn Dis* 2006;16:943-7.

Physical activity may prevent some illnesses. To study whether this is so, we need accurate information on physical activity. BWHS participants in the Washington D.C. area took part in a physical activity validation study at Howard University organized by Dr. Adams-Campbell. For a week the women wore "actigraphs", which look like watches and which measure movement. During that week the women also wrote down their activities in diaries. We compared the actigraph measures, the diary reports, and what the women reported about physical activity on the BWHS survey. Women who had the highest actigraph measures also tended to report the most activity in their diaries and the most physical activity on the BWHS survey. These results show that physical activity information given by BWHS participants on the health surveys will be useful in studies of exercise and disease. We are grateful to the women who took part in this study.

Cozier YC, Palmer JR, Horton NJ, Fredman L, Wise LA, Rosenberg L. Racial discrimination and the incidence of hypertension in U.S. Black women. *Ann Epidemiol* 2006;16:681-7.

The occurrence of hypertension (high blood pressure) is 2-3 times greater in Black women than white women, and the condition increases the risk of heart disease and other serious illnesses. Stressors, such as experiences of racial discrimination, may increase the risk of hypertension. To see if this was happening in the BWHS, we studied the experiences of racism reported by BWHS participants on the 1997 BWHS health survey in relation to the occurrence of hypertension in the following years. Overall, the occurrence of hypertension was similar in women who did and did not experience racial discrimination. However, in the foreign born women, those who reported more experiences of discrimination also developed more hypertension. If confirmed, this finding may mean that foreign born women have a different response to experiences of racism than women born in the United States.

Rosenberg L, Boggs DA, Wise LA, Palmer JR, Roltsch MH, Makambi KH, Adams-Campbell LL. A follow-up study of physical activity and incidence of colorectal polyps in African-American women. *Cancer Epidemiol Biomarkers Prev* 2006;15(8):1438-42.

Some types of colorectal polyps are thought to lead to colon cancer. We investigated the effect of physical activity from walking or vigorous exercise on colon polyps in an analysis that included 1,390 cases of colon polyps reported by BWHS participants. We

found that the incidence of colon polyps was reduced among women who exercised, and the reduction was greatest for women who exercised the most. These results contribute to the large body of evidence that exercise has many health benefits.

Datta GD, Subramanian SV, Colditz GA, Kawachi I, Palmer JR, Rosenberg L. Individual, neighborhood, and state-level predictors of smoking among U.S. Black women: a multilevel analysis. *Soc Sci Med* 2006;63:1034-44.

We looked at whether the economic level of the neighborhoods in which BWHS participants live affects whether they smoke. To do so, we obtained information from the U.S. Census Bureau on what percent of people in particular neighborhoods are living below the “poverty level”, as defined by the federal government. BWHS participants who lived in neighborhoods with high levels of poverty were more often smokers than women who lived in neighborhoods with lower levels of poverty. Taking into account personal factors like educational level did not change this finding. We conclude that the surroundings in which women live play a role in whether they smoke. There are many possible reasons for this. As an example, more cigarette advertising is aimed at people who live in neighborhoods with higher poverty levels.

Krishnan S, Rosenberg L, Palmer JR. Glycemic load, glycemic index, cereal fiber and risk of Type 2 diabetes in African-American women (abstract). *Am J Epidemiol* 2006;163(Suppl):S184.

Intake of foods with a high glycemic index or load (e.g., potatoes) was associated with a higher risk of diabetes, whereas intake of foods high in cereal fiber was associated with a lower risk.

Wise LA, Palmer JR, Cozier YC, Stewart EA, Rosenberg L. Perceptions of racial discrimination and risk of uterine leiomyomata (abstract). *Am J Epidemiol* 2006;163(Suppl):S58.

Fibroids in the womb (uterine leiomyomata) occurred more often in BWHS participants who reported frequent experiences of racism than in women who reported fewer experiences.

Cozier YC, Palmer JR, Rosenberg L. The relation of physical activity to risk of hypertension in the Black Women’s Health Study (abstract). *Am J Epidemiol* 2006;163(Suppl):S42.

Participation in vigorous physical activity was associated with a decreased occurrence of hypertension among BWHS participants. The effect of walking was much weaker.

Palmer JR, Boggs D, Krishnan S, Hu F, Rosenberg L. Soft drink consumption and risk of Type 2 diabetes in African-American women (abstract). *Am J Epidemiol* 2006;163(Suppl):S181.

The risk of diabetes increased with increasing consumption of sugar-sweetened soft drinks, suggesting that risk could be reduced by decreasing intake of sugared soft drinks.

Rosenberg L, Boggs D, Wise LA, Palmer JR, Roltsch MH, Makambi KH, Adams-Campbell LL. A follow-up study of physical activity and incidence of colorectal polyps in African-American women (abstract). *Am J Epidemiol* 2006;163(Suppl):S72.

BWHS participants who exercised were less likely to develop colorectal polyps than women who were inactive. The exercise included walking and vigorous activity such as jogging.

Wise LA, Palmer JR, Rosenberg L, Adams-Campbell LL. Anthropometric risk factors for colorectal polyps in African-American women (abstract). *Am J Epidemiol* 2006;163(Suppl):S104.

BWHS participants who gained weight were more likely to develop colorectal polyps than women whose weight was stable. Also, carrying the overweight in the waist was associated with a higher risk of polyps than carrying it in the hips.

Wise LA, Adams-Campbell LL, Palmer JR, Rosenberg L. Leisure-time physical activity in relation to depressive symptoms in the Black Women's Health Study. *Ann Behav Med* 2006;32(1):68-76.

Researchers looked at two types of physical activity: walking for exercise and vigorous exercise (e.g., aerobics, running swimming, and basketball). Results showed that women who took part in vigorous exercise in high school or adulthood, but not both, had fewer symptoms of depression than women who were never active. Women who exercised vigorously both in high school and adulthood had the fewest symptoms of depression of all. Walking for exercise lowered the risk of depression among women who were very overweight (Body Mass Index of 30 or higher) but not among women who were less overweight or of normal weight. The BWHS results suggest that increasing levels of physical activity may improve mental health.

Rosenberg L, Palmer JR, Wise LA, Adams-Campbell LL. A prospective study of female hormone use and breast cancer among Black women. *Arch Intern Med* 2006;166:760-5.

Millions of women in the U.S. have used menopausal female hormone supplements. Epidemiologic studies have found that women who use female hormone supplements have an increased risk of breast cancer. Most of the women in those studies were white women. We investigated the effect of female hormone use on breast cancer occurrence in the BWHS. From 1995 to 2003, 615 participants were diagnosed with breast cancer. The incidence of breast cancer was 58% greater in women who used female hormone supplements for 10 or more years and were still using them than among nonusers. The increases in breast cancer risk appeared to be greater for women who had taken estrogen with progesterone than for women who took estrogen alone, and the increases were more apparent in thinner women than in heavier women. These data strengthen the evidence that use of female hormones increases the risk of breast cancer. Current recommendations are that women who use female hormone supplements for the relief of menopausal symptoms should do so for the shortest time possible.

Palmer JR, Adams-Campbell LL, Boggs DA, Wise LA, Rosenberg L. The relation of overall and central obesity to risk of breast cancer in African-American women (abstract). *Proc Am Assoc Cancer Res* 2006;47:2024.

Many studies of white women have found that women who are overweight at age 18 have a lower risk of breast cancer before menopause compared to thinner women. The studies also show that women who are overweight after the menopause have a higher risk of breast cancer compared to thinner postmenopausal women. Preliminary results in the BWHS show that women who were overweight at age 18 have a lower risk of breast cancer later in life, whether before or after the menopause. Overweight after the menopause was not related to an increased risk of breast cancer.

Datta G, Colditz GA, Kawachi I, Subramanian SV, Palmer JR, Rosenberg L. Individual-, neighborhood-, and state-level socioeconomic predictors of cervical carcinoma screening among U.S. Black women: a multilevel analysis. *Cancer* 2006;106(3):664-9.

Pap smears are a screening tool for the early detection of cervical cancer. We studied whether neighborhood socioeconomic factors influence whether women in the BWHS go for Pap smear screening. We found that women who lived in neighborhoods with high levels of poverty were less likely to go for screening than women who lived in wealthier neighborhoods. There may be barriers to Pap screening in the poorer neighborhoods, such as difficulties with obtaining medical care or transportation, that need to be addressed in order that all women have access to Pap screening.

## 2005

Agurs-Collins T, Makambi K, Palmer JR, Rosenberg L, Adams-Campbell LL. Dietary patterns and breast cancer risk in women participating in the Black Women's Health Study (abstract). In: *Frontiers in Cancer Prevention Research. Proceedings*. Baltimore, MD. October 30-November 2, 2005. Philadelphia: AACR, 2005: Abstract #69.

On the 1995 health survey, BWHS participants answered more than 60 questions on what they ate. Preliminary analyses of this information suggest that women who ate a more "prudent" diet, which is high in fruits and vegetables, whole grains, fish and poultry, may have a lower risk of developing breast cancer, and women who ate more of a "Western" diet, high in meat, refined grains, and sweets, may have a higher risk.

Rosenberg L, Wise LA, Palmer JR, Horton NJ, Adams-Campbell LL. A multilevel study of socioeconomic predictors of regular mammography use among African-American women. *Cancer Epidemiol Biomarkers Prev* 2005;14(11):2628-33.

Current recommendations are that women go for screening mammograms for breast cancer on a regular basis once they reach age 40. The hope is that finding breast cancers early will result in more effective treatment and better survival. We used information

reported on the 1997, 1999, and 2001 health surveys to find out what factors affect regular mammography use in the BWHS. Having health insurance was the most important predictor of whether women went for mammograms on a regular basis. The loss of health insurance is an increasing problem; women who do not have insurance may be able to find federal or state programs to pay for their screening mammogram.

Rosenberg L, Wise LA, Palmer JR. Hair-relaxer use and risk of preterm birth among African-American women. *Ethn Dis* 2005;15:768-72.

Black babies are born preterm (premature) more frequently than white babies and known causes do not explain the difference. Hair relaxers are often used by Black women, and these preparations contain unknown substances that might be harmful and possibly lead to premature birth. Based on reports of babies born to BWHS participants from 1995 to 2001, we assessed whether hair relaxer use was related to the occurrence of preterm birth. We found that use was not related to preterm birth, even use that had lasted many years and was frequent.

Krishnan S, Palmer JR, Djousse L, Rosenberg L. Obesity and the risk of type 2 diabetes in U.S. Black women (abstract). *Am J Epidemiol* 2005;161:S53.

Type 2 (or adult onset) diabetes is increasing and is twice as high among Black women as white women. Based on data collected in the BWHS, women with a body mass index of 45 or greater developed diabetes 21 times more often than women with a body mass index less than 23. These results clearly show the large harmful impact of overweight and obesity on the occurrence of diabetes.

Cozier YC, Palmer JR, Rosenberg L. The risk of hypertension associated with very high BMI in the Black Women's Health Study (abstract). *Am J Epidemiol* 2005;161:S51.

Obesity is a known cause of hypertension but few studies have evaluated the effects of very high levels of obesity. Based on BWHS data, we found that the incidence of hypertension increased as women's body mass index increased. The incidence of hypertension in women with a body mass index of 45 or more was 7.7 times greater than that among women with a body mass index of 20-22. A body mass index of 20-24 is considered to be a "healthy" weight; 25-29 is considered to be "overweight"; and 30 or greater is "obese".

Wise LA, Palmer JR, Adams-Campbell LL, Rosenberg L. Leisure-time physical activity in relation to depressive symptoms in the Black Women's Health Study (abstract). *Am J Epidemiol* 2005;161:S121.

Physical activity has beneficial effects on many conditions, but its effect on depression is less clear. In 1999, BWHS participants filled out 20 questions about how they were feeling, the CES-D scale, which measures symptoms of depression. Women who exercised vigorously had fewer symptoms than women who did not exercise, which suggests that leisure-time physical activity may reduce depressive symptoms.

Rosenberg L, Wise LA, Palmer JR, Adams-Campbell LL. A multilevel prospective study of regular mammography use in the Black Women's Health Study (abstract). *Am J Epidemiol* 2005;161:S43.

Little is known about factors that influence whether women return for mammography screening on a regular basis. We assessed data on mammography use and other factors reported by BWHS participants on the 1997, 1999, and 2001 health surveys. The most important predictor of regular attendance for mammography screening in the BWHS was having health insurance.

Palmer JR, Wise LA, Adams-Campbell LL, Rosenberg L. Cigarette smoking and risk of breast cancer in the Black Women's Health Study (abstract). *Am J Epidemiol* 2005;161:S55.

A few studies have reported that women who smoke heavily and who started smoking at a young age may have an increased risk of breast cancer. In analyses of BWHS data collected from 1995 to 2003, cigarette smoking was not associated with breast cancer risk overall. However, there was a suggestion in the data that risk might be increased for women who smoked for many years and began at a young age. Further data will need to be collected to confirm whether this is so.

Wise LA, Palmer JR, Spiegelman D, Harlow BL, Stewart EA, Adams-Campbell LL, Rosenberg L. Influence of body size and body fat distribution on risk of uterine leiomyomata in U.S. Black women. *Epidemiology* 2005;16(3):346-54.

Uterine fibroids occur 2-3 times more often in Black women than white women. They can cause pain and bleeding and lead to hysterectomy. We assessed the influence of body size and body fat distribution on the occurrence of uterine fibroids, using data from the BWHS collected from 1997 to 2001. During that time period, 2,146 premenopausal women reported having been diagnosed with a fibroid through ultrasound or hysterectomy. All women with a body mass index (BMI) of 20 or greater had a higher risk of fibroids than women with a BMI <20. (BMI <20 is defined as thin, 20-24.9 as appropriate weight, 25-29.9 as overweight, and 30 or greater as obese). The risk of having a fibroid increased as BMI increased, to a peak at BMI 27.5-29.9 and then decreased. Weight gain since age 18 was positively associated with risk among women who had had children but not among women who had never had a child. Waist and hip circumference were not associated with risk of fibroids. These findings indicate that there is a complex relationship between BMI and risk of uterine fibroids, but that risk is lowest for thin women.

Wise LA, Palmer JR, Stewart EA, Rosenberg L. Age-specific incidence rates for self-reported uterine leiomyomata in the Black Women's Health Study. *Obstet Gynecol* 2005;105(3):563-8.

Data reported on uterine fibroids by BWHS participants from 1997 to 2001 were used to calculate incidence rates. The overall incidence rate of uterine fibroids was 34 per 1000 women per year—that is, 34 women out of each 1000 who had not had fibroids before developed uterine fibroids. The incidence rate was highest among women who were 40-



44 years of age. The incidence rate of uterine fibroids in U.S. Black women is 2 to 3 times higher than the rate in white women; reasons for the difference are unknown.

## 2004

Wise LA, Palmer JR, Harlow BL, Spiegelman D, Stewart EA, Adams-Campbell LL, Rosenberg L. Risk of uterine leiomyomata in relation to tobacco, alcohol, and caffeine consumption in the Black Women's Health Study. *Hum Reprod* 2004;19(8):1746-54.

Fibroids in the uterus (womb) affect Black women 2-3 times more often than white women. They can cause pain and bleeding and can lead to hysterectomy. Tobacco, alcohol, and caffeine consumption could influence the risk of uterine fibroids through changes in female hormones. We assessed this possibility with data from the BWHS collected during 1997 through 2001. During that time period, 2,177 premenopausal women reported the occurrence of a uterine fibroid diagnosed through ultrasound or hysterectomy. The risk of fibroids was not associated with cigarette smoking but it was associated with alcohol consumption, particularly consumption of beer. Women who drank at least 7 beers a week had a greater risk of fibroids than nondrinkers. Fibroids were not associated with coffee drinking in women overall, but among women under 35 years of age those who drank at least 3 cups a day appeared to have a higher risk of fibroids than nondrinkers. These findings are new and require confirmation in further studies. If confirmed, modifiable risk factors for fibroids—alcohol and coffee consumption— will have been identified.

Rosenberg L, Wise LA, Palmer JR. Hair relaxer use and risk of preterm birth in the Black Women's Health Study (abstract). *Am J Epidemiol* 2004;159:S91.

We assessed whether hair relaxer use is associated with preterm birth (baby born at least 3 weeks early) in the BWHS. We compared 497 babies born preterm because of premature rupture of membranes or premature labor for no known reason with 5633 full-term babies, whose births were reported on the 1997, 1999, and 2001 health questionnaires. There were no differences in hair relaxer use between mothers of the preterm and full-term babies, suggesting that hair relaxer use does not influence the occurrence of preterm birth.

Datta GD, Subramanian SV, Rosenberg L. A multilevel assessment of individual and neighborhood characteristics associated with smoking among Black women (abstract). *Am J Epidemiol* 2004;159:S74.

We assessed whether characteristics of the neighborhood in which BWHS participants live are associated with cigarette smoking, as reported in 1995. Information on the poverty level of the census tracts in which BWHS participants live was obtained from the U.S. Census. After taking into account women's age, education, marital status, and occupation, it was found that the percent of women who were current smokers increased

as the percent of residents below the poverty level increased. These findings suggest that characteristics of women's neighborhoods play a role in smoking behavior above and beyond individual characteristics.

Wise LA, Palmer JR, Adams-Campbell LL, Rosenberg L. Age-specific incidence rates for uterine leiomyomata in the Black Women's Health Study (abstract). *Am J Epidemiol* 2004;159:S92.

Although uterine fibroids are a major problem among Black women, there is relatively little information on age-specific rates of occurrence. The BWHS provides the most informative information to date on this question. Based on 2,279 new occurrences of fibroids confirmed by ultrasound or hysterectomy that were reported by BWHS participants on the 1999 and 2001 health questionnaires, the incidence rate was 17.8 per 1000 women per year at ages <30, peaked at 39.8 per 1000 women per year at ages 40-44, and then decreased.

Cozier YC, Palmer JR, Horton NJ, Fredman L, Rosenberg L. Neighborhood socioeconomic status and risk of hypertension in Black women (abstract). *Am J Epidemiol* 2004;159:S73.

Neighborhoods have characteristics that could affect health (e.g., by affecting stress levels or the ability to exercise). We assessed whether neighborhood socioeconomic status (SES) is associated with the occurrence of hypertension (high blood pressure) in the BWHS. Information on the SES of neighborhoods was obtained from the U.S. Census. During 1995-2001 4,895 BWHS participants reported having been diagnosed with hypertension for the first time. After taking into account individual characteristics such as age, weight, education, smoking, and exercise, we found that lower neighborhood SES was associated with a higher occurrence of hypertension. This suggests that neighborhood environment may be contributing to the excess of hypertension among Black women in the U.S.

Taylor TR, Makambi K, Adams-Campbell LL, Harrell JP, Rosenberg L, Palmer JR. Racial discrimination and breast cancer in Black women: the Black Women's Health Study (abstract). *Ann Behav Med* 2004;24(Suppl):S181.

On the 1997 BWHS health survey, participants completed 9 questions about unfair treatment in everyday life and experiences of racial discrimination on the job, in housing and in police encounters. Preliminary analyses show no relationship of these experiences to the occurrence of breast cancer. The relationship of racial discrimination to the stage at which breast cancer is diagnosed will be assessed in future analyses.

Williams CD, Adams-Campbell LL, Taylor TR, Palmer JR, Rosenberg L. Depressive symptoms by socio-demographic characteristics in The Black Women's Health Study (abstract). *Ann Behav Med* 2004;24(Suppl):S146.

On the 1999 BWHS health survey, participants completed 20 questions, the "CES-D" scale which is a measure of feelings of depression. The present analysis found that older

and younger women differed in the types of symptoms they reported, and that depression scores were lower for older women, married women, and those with higher levels of education. The relation of depression scores to the occurrence of various illnesses will be assessed in future analyses.

Palmer JR, Wise LA, Adams-Campbell LL, Rosenberg L. A prospective study of induced abortion and breast cancer in African-American women. *Cancer Causes Control* 2004;15:105-11.

There has been controversy about whether having an abortion might increase the risk of breast cancer, although the weight of evidence from large and well-conducted studies indicates that there is no effect. There has been very little study of abortion and breast cancer in African-American women. Based on data collected in the BWHS, induced abortion was not associated with the occurrence of breast cancer. Also, the number of abortions or the age at which the abortion occurred did not influence the risk of breast cancer. These results from the BWHS indicate clearly that induced abortion does not increase the risk of breast cancer in African-American women.

Wise LA, Palmer JR, Harlow BL, Spiegelman D, Stewart EA, Adams-Campbell LL, Rosenberg L. Reproductive factors, hormone contraception, and risk of uterine leiomyomata in African-American women: a prospective study. *Am J Epidemiol* 2004;159:113-23.

Uterine fibroids occur 2-3 times more commonly in Black women than white women. During follow-up of BWHS participants through 2001, over 2000 women developed uterine fibroids. Based on data on reproductive history and other factors, we found that risk of fibroids was lower for women who had a later age at start of menstruation, a later age at the birth of their first child, more children, or a recent birth. Women who used progestin-only injectable contraceptives also appeared to have a reduced risk. This is the largest follow-up study of uterine fibroids in Black women yet conducted. The results confirm that reproductive history plays an important role in the occurrence of fibroids and are useful for elucidating mechanisms of occurrence.

Cozier YC, Palmer JR, Rosenberg L. Comparison of methods for collection of DNA samples by mail in the Black Women's Health Study. *Ann Epidemiol* 2004;14(2):117-22.

Genetic polymorphisms may influence the occurrence of some diseases. To test hypotheses concerning genetic polymorphisms, DNA samples are needed. Cheek cells are an excellent source of DNA. A study in which over 1000 BWHS participants took part demonstrated that it is feasible to collect cheek cell samples by mail. Two collection methods were tested—swishing the mouth with mouthwash, and swabbing the cheek with a soft brush. Both methods were acceptable to participants but the mouthwash method yielded much larger amounts of DNA. Cheek cell samples through mouthwash are being collected from all BWHS participants willing to provide them.

Rosenberg L, Palmer JR, Wise LA, Horton NJ, Kumanyika SK, Adams-Campbell LL. A prospective study of the effect of childbearing on weight gain in African-American women. *Obes Res* 2003;11:1526-35.

Overweight and obesity have increased greatly in the U.S. in recent decades and are a particular problem for Black women. We used BWHS data on weight and childbearing collected during the first four years of follow-up, 1995 to 1999, to assess whether having a child was associated with increased long-term weight gain. We found that women who had a first child gained more weight than women who had a second or later child, and that the weight gain of all three groups was more than that of women who did not have a child. The difference in weight gain between women who had a child and women who did not was greatest for women who were overweight to begin. The results indicate that childbearing is an important contributor to weight gain among Black women.

McAlindon TE, Formica M, Palmer JR, Lafyatis R, Rosenberg L. Assessment of strategies for identifying diagnosed cases of systemic lupus erythematosus through self-report. *Lupus* 2003;12:754-9.

Systemic lupus erythematosus (lupus) affects Black women more frequently than other women in the U.S. The assessment of potential causes of lupus has been hindered by the difficulty in identifying women with the illness. We assessed whether use of a symptom list filled out by BWHS participants on the 1997 questionnaire might be helpful in distinguishing between women with and without lupus. The study involved review of medical records of women with and without symptoms who reported having received a diagnosis of lupus. The symptom list was not helpful, but we found that women reported lupus with a satisfactory degree of accuracy, particularly those taking medications for the illness. A paper based on BWHS data has linked smoking to an increased risk of lupus, and other studies are in progress.

Formica MK, Palmer JR, Rosenberg L, McAlindon TE. Smoking, alcohol consumption, and risk of systemic lupus erythematosus in the Black Women's Health Study. *J Rheumatol* 2003;30(6):1222-6.

Systemic lupus erythematosus (lupus) occurs more commonly in African-American than white women. BWHS data indicate that cigarette smoking is associated with an increased occurrence of lupus. Previous studies suggested that alcohol consumption might be protective. Those studies had flaws that were overcome in the BWHS. BWHS data indicate that there is no relation between alcohol consumption and lupus. The data on smoking provide yet another reason for women to not smoke.

Cozier YC, Palmer JR, Horton NJ, Rosenberg L. Perceptions of racial discrimination and the incidence of hypertension in African-American women (abstract). *Am J Epidemiol* 2003;157:S93.

Experiences of racial discrimination may act as stressors that increase the occurrence of hypertension. We assessed this possibility using BWHS data. There were some small

increases in risk of hypertension associated with responses to some of the questions about discrimination, but mostly the results suggest no association.

Wise LA, Palmer JR, Adams-Campbell LL, Rosenberg L. Risk of uterine leiomyomata in relation to alcohol, caffeine, and tobacco use in the Black Women's Health Study (abstract). *Am J Epidemiol* 2003;157:S101.

Alcohol consumption and caffeine consumption have been suggested to be risk factors for uterine fibroids. Preliminary analysis of BWHS data suggested a slightly greater risk of fibroids in drinkers, but little difference according to caffeine consumption. Smokers had a slightly lower risk of uterine fibroids than nonsmokers.

Wise LA, Palmer JR, Adams-Campbell LL, Rosenberg L. Body size and risk of uterine leiomyomata in premenopausal Black women (abstract). *Am J Epidemiol* 2003;157:S91.

Uterine fibroids occur commonly among premenopausal African-American women. In an assessment of BWHS data on newly occurring fibroids, we found that fibroids occurred more often in women who were overweight, and that weight gain since age 18 was also associated with a greater occurrence.

Rosenberg L, Palmer JR, Wise LA, Adams-Campbell LL. A prospective study of female hormone use and breast cancer incidence among African-American women (abstract). *Am J Epidemiol* 2003;157:S98.

Hormone replacement therapy has been used by millions of women. Data on white women indicate that hormone supplements increase the risk of breast cancer. BWHS data are the first concerning Black women. They indicate that breast cancer risk is increased among women who use hormone supplements, especially estrogen together with progesterone, that the risk increases as the duration of use increases, and that the effect is more evident in thinner women.

Palmer JP, Wise LA, Horton NJ, Adams-Campbell LL, Rosenberg L. Dual effect of parity on breast cancer risk in African-American women. *J Natl Cancer Inst* 2003;95:478-83.

Black women have a higher incidence of breast cancer than white women before age 45, and a lower incidence after age 45. BWHS results indicate that parity has a dual effect on the occurrence of breast cancer, depending upon a woman's age. Before 45 years of age, women who have had several children appear to have a higher risk of breast cancer than women who have had few children. At older ages, however, the incidence among women who have had several children is lower than among women with few children or none at all. These results will be useful in helping to explain the mechanism of breast cancer occurrence, and they also help explain the Black-white crossover in breast cancer incidence.

Palmer JR, Rosenberg L, Wise LA, Adams-Campbell LL. Onset of natural menopause in African American women. *Am J Public Health* 2003;93:299-306.

Age at menopause affects the occurrence of breast cancer, osteoporosis, and other illnesses. Factors related to the onset of natural menopause in Black women have not received much study. These analyses of BWHS data were based on follow-up of participants from 1995 to 1999. Overweight women had a later menopause than thinner women and women who used oral contraceptives had a later menopause than nonusers. However, the strongest determinant of the occurrence of natural menopause was cigarette smoking – current and ex-smokers reached menopause earlier than nonsmokers. Factors not significantly related to the onset of natural menopause were age at start of menstrual periods, education, childbearing, physical activity, and experiences of racism.

Kumanyika SK, Mauger D, Mitchell DC, Phillips B, Wright H, Palmer JR. Relative validity of food frequency questionnaire nutrient estimates in the Black Women's Health Study. *Ann Epidemiol* 2003;13:111-8.

This paper presents the results of the BWHS diet validation study. There was a good correlation between the reporting of most nutrients on the BWHS 1995 questionnaire with food diaries and 24-hour diet recalls provided by BWHS participants in the diet validation study. These results give promise that analyses of diet in relation to various illnesses will be informative.

## **2002**

Rosenberg L, Palmer JR, Wise LA, Horton NJ, Corwin MJ. Perceptions of racial discrimination and the risk of preterm birth. *Epidemiology* 2002;13:646-52.

Black babies are more often born preterm (premature or early) than white babies. These analyses were based on births reported on the 1997 and 1999 questionnaires: the mothers of 422 preterm babies were compared to the mothers of 4544 full term babies. Overall, the risk of preterm birth was not related to responses to 7 of 9 questions about experiences of racism, but risk was slightly higher for women who reported unfair treatment on the job and that people acted afraid of them at least once a week. Among women with 12 years or less education, there were increased risks of preterm birth for 4 of the questions about racism. These data are suggestive. It will be important to reassess the question of whether experiences of racism increase preterm birth based on births reported by BWHS participants on the questionnaires.

Rosenberg L, Palmer JR, Rao RS, Adams-Campbell LL. Patterns and correlates of alcohol consumption among African-American women. *Ethn Dis* 2002;12:548-54.

Heavy drinking is related to many illnesses, such as liver disease. Most BWHS participants drink alcohol moderately if at all. Among those who drink more heavily, the strongest predictor was having begun drinking at an early age and having drunk greater quantities at that time. Consumption of alcohol was also strongly related to smoking.

Rosenberg L, Palmer JR, Wise LA, Horton NJ. Perceived racism in relation to preterm birth in the Black Women's Health Study (abstract). *Am J Epidemiol* 2002;155:S95.

The 1997 BWHS questionnaire contained 9 questions about experiences of racism. In preliminary analyses, responses to most of the questions were unrelated to preterm birth overall. However, among women with lower levels of education, some of the variables were related to an increased risk.

Palmer JR, Wise LA, Adams-Campbell LL, Rosenberg L. Childbearing and breast cancer risk in Black women (abstract). *Am J Epidemiol* 2002;155:S73.

These preliminary results suggest that parity has a dual effect on the occurrence of breast cancer, depending upon a woman's age. Before 45 years of age, women who have had several children appear to have a higher risk of breast cancer than women who have had few children. At older ages, however, the incidence among women who have had several children is lower than among women with few children or none at all.

Wise LA, Palmer, JR, Adams-Campbell LL, Rosenberg L. Reproductive factors, hormone use, and risk of uterine leiomyomata in Black women (abstract). *Am J Epidemiol* 2002;155:S64.

In preliminary results, the occurrence of uterine fibroids was greater among women who began to menstruate at a young age and among women who had their first child at an older age. Risk was reduced if a woman had a recent pregnancy. These results indicate that the occurrence of uterine fibroids is strongly influenced by reproductive factors.

## **2001**

Cozier YC, Palmer JR, Rosenberg L. Comparison of methods for collection of DNA samples by mail in the Black Women's Health Study (abstract). *Am J Epidemiol* 2001;153:S95.

Participation rates of women who were invited to provide cheek cell samples by means of mouthwash (swished in the mouth for about 45 seconds) were similar to those of women who were invited to provide cheek cell samples through swabs (rubbed on the inside of the cheek). However, the yield of DNA from the cheek cells was much greater from the mouthwash samples. Thus, cheek samples will be collected from BWHS participants by means of mouthwash.

Rosenberg L, Rao RS, Palmer JR, Adams-Campbell LL. Age at natural menopause among African-American women (abstract). *Am J Epidemiol* 2001;153:S92.

Age at menopause influences the occurrence of osteoporosis, breast cancer, and other illnesses. Current smoking and a measure of racism (how often women thought about their race) were associated with an earlier natural menopause in preliminary analyses.

The present results suggest that Black and white women share an important determinant of the age at natural menopause, cigarette smoking.

Palmer JR, Rao RS, Adams-Campbell LL, Rosenberg L. Age at attainment of adult height in relation to risk of breast cancer in Black Women's Health Study (abstract). *Am J Epidemiol* 2001;153:S33.

The hypothesis has been raised that later age at reaching adult height may be related to a reduced risk of breast cancer, because height may be a marker for later exposure to growth hormones and other hormones. BWHS data do not provide material support for this theory.

Russell C, Palmer JR, Adams-Campbell LL, Rosenberg L. Follow-up of a large cohort of Black women. *Am J Epidemiol* 2001;154:845-53.

High retention rates in follow-up studies like the BWHS are essential for valid results. Participants in the BWHS are highly mobile, with 56% having moved at least once during the first follow-up period. Multiple sources of information were used to locate participants whose addresses were unknown, including the postal service, participants themselves through postcards, telephone calls, and emails, and contacts of participants. Adequate follow-up was attained, with the most cost-effective method for eliciting completed questionnaires being multiple mailings of questionnaires.

Adams-Campbell LL, Rosenberg L, Rao RS, Palmer JR. Strenuous physical activity and breast cancer risk in African-American women. *J Natl Med Assoc* 2001;93:267-75.

In recent years evidence from studies of white women has suggested that exercise may reduce the occurrence of breast cancer. Results from the BWHS are the first concerning Black women. Based on cases of breast cancer that participants reported when they entered the BWHS in 1995, strenuous physical activity in young adulthood was associated with reduced breast cancer risk. While the results suggest a protective effect of strenuous exercise, they are not definitive because it is necessary to demonstrate this with newly occurring cases of breast cancer. It will be possible to assess exercise in relation to newly occurring breast cancer in the BWHS after further years of follow-up.

Cozier YC, Palmer JR, Rosenberg L, Adams-Campbell LL. Recent mammography use among African-American women. *Ethn Dis* 2001;11:188-91.

In the past, lower rates of mammography use among Black women may have resulted in later diagnosis of breast cancer, leading to higher mortality rates than among white women. In 1997, the National Cancer Institute and American Cancer Society changed their mammography guidelines to recommend annual screening mammograms for women aged 40 and older. Information provided by BWHS participants in 1995 indicates that their rates of mammography use are high, and that a high proportion of women 40-49 made use of mammography even before the new guidelines were introduced.



Palmer JR, Rao RS, Adams-Campbell LL, Rosenberg L. Height and breast cancer risk: results from the Black Women's Health Study (United States). *Cancer Causes Control* 2001;12:343-8.

BWHS data indicate that taller women have a slightly higher risk of developing breast cancer than shorter women. The difference in risk between tall and short women is too small to be of any importance to individuals, but it is of scientific interest because it may provide some clues about the causes of breast cancer. One theory is that taller women have more breast cells, providing more opportunity for a mutation to occur that leads to cancer. Another theory involves hormones that affect both height and cell division.

## 2000

McAlindon TE, Formica MK, Palmer TR, Rosenberg L. Is childhood smoke exposure a risk factor for SLE? Results from the Black Women's Health Study (BWHS) (abstract). *Arthritis Rheum* 2000;43(S):S237.

Adult smoking and exposure to the smoke of others were assessed in relation to systemic lupus erythematosus (SLE, lupus), based on 46 BWHS participants who developed the illness. Both smoking in adulthood and childhood exposure to smoke were associated with an increased risk of lupus. The collection of further data will permit more informative analyses of this possibility.

Lancaster KJ, Smiciklas-Wright H, Kumanyika SK, Mitchell DC, Mauger D, Palmer JR. Food diary response rates in a sample of African-American women: respondent characteristics and nutrient intake. *J Am Diet Assoc* 2000;100:1532-5.

A diet validation study was carried out within the BWHS, in which participants were asked to provide 24-hour recalls of food intake by telephone, and also to keep 3-day food diaries, which they mailed in. This paper reports on characteristics of women who kept food diaries and those who did not. There were some differences, such as women who did not keep food diaries having more child-care responsibilities than those who kept diaries, but the nutrient intakes of the two groups were similar.

Formica MK, McAlindon TE, Palmer TR, Rosenberg L. Discoid lupus erythematosus and smoking among African-American women (abstract). *Am J Epidemiol* 2000;151:S88.

Discoid lupus is a form of lupus that affects the face and scalp. These data suggest that cigarette smoking may increase the risk.

Cozier Y, Jones C, Palmer JR, Rao RS, Adams-Campbell LL, Rosenberg L. Perceptions and experiences of racism among African-American women (abstract). *Am J Epidemiol* 2000;151:S24.

The frequency of reporting experiences and perceptions of racism was greater among younger women. The frequency was also higher among women with higher levels of education. The latter suggests that experiences and perceptions of racism do not diminish with increasing socioeconomic status as measured by level of education.

Rosenberg L, Palmer JR, Rao RS, Corwin M. Risk factors for preterm birth among women in the Black Women's Health Study (abstract). *Am J Epidemiol* 2000;151:S13.

In these preliminary analyses, preterm birth was most strongly associated with having had a previous preterm birth, the mother having been preterm herself, and the mother having had no previous children. Preterm birth was less common among women with higher levels of education.

Kumanyika S, Rosenberg L, Palmer JR, Rao RS, Adams-Campbell LL. Demographic and personal factors associated with obesity in the Black Women's Health Study (BWHS) cohort (abstract). *Am J Epidemiol* 2000;151:S52.

Obesity as an adult was strongly associated with obesity at age 18 and with physical inactivity. These findings suggest a need to emphasize obesity prevention in childhood and adolescence and to promote participation in physical activity.

Adams-Campbell LL, Rosenberg L, Washburn RA, Rao RS, Kim KS, Palmer JR. Descriptive epidemiology of physical activity in African-American women. *Prev Med* 2000;30:43-50.

BWHS participants generally reported low levels of physical activity. Greater participation in strenuous exercise was related to higher levels of education. Participation in exercise was also greater among women who had exercised in high school, suggesting that educational efforts to increase levels of physical activity should start at early ages.

## 1999

Palmer JR, Rao RS, Adams-Campbell LL, Rosenberg L. Correlates of hysterectomy among African-American women. *Am J Epidemiol* 1999;150:1309-15.

Women who lived in the South or who had lower levels of education were more likely to have had an early hysterectomy than women with higher levels of education or who lived in other regions. Different rates of medical conditions that lead to hysterectomy did not explain the differences. The associations with region and education suggest that some women are not being told of possible alternatives to hysterectomy.

Rosenberg L, Adams-Campbell LL, Kim KS, Palmer JR. Physical activity and breast cancer among African-American women (abstract). *Am J Epidemiol* 1999;149:S53.

In these preliminary analyses, there was a trend of decreasing risk of breast cancer with increasing exercise during early reproductive life.

Palmer JR, Rao RS, Adams-Campbell LL, Rosenberg L. Height in relation to breast cancer risk in the Black Women's Health Study (abstract). *Am J Epidemiol* 1999;149:S53.

As in many studies of other populations, increased height was associated with a small increase in the risk of breast cancer.

Russell CW, Palmer JR, Adams-Campbell LL, Rosenberg L. The Black Women's Health Study: methods for maintaining follow-up in a mobile population (abstract). *Am J Epidemiol* 1999;149:S17.

There was a high rate of changing addresses in the BWHS between enrollment and completion of the first follow-up. Moving was strongly related to age, with the youngest women moving most often. Methods used to maintain contact include Newsletters, use of the national change of address file, the postal service, and friends and relatives of participants.

Rosenberg L, Palmer JR, Rao RS, Adams-Campbell LL. Risk factors for coronary heart disease in African American women. *Am J Epidemiol* 1999;150:904-9.

BWHS data suggest that important risk factors of coronary heart disease in Black and white women are similar. These include smoking, high blood pressure, diabetes, high cholesterol, family history of heart attack, and obesity. Because most of these factors can be modified (for example, women can give up smoking and they can take medication for high blood pressure), it is possible for many Black women to reduce their risk of developing heart disease.

Rosenberg L, Palmer JR, Adams-Campbell LL, Rao RS. Obesity and hypertension among college-educated Black women in the United States. *J Hum Hypertens* 1999;13:237-41.

There was a high rate of overweight and of high blood pressure among BWHS participants with high levels of education. This was also the case among women with less education. Overweight was strongly associated with an increased risk of high blood pressure at all educational levels.

## 1998

Palmer JR, Rosenberg L, Adams-Campbell LL, Rao RS. Correlates of hysterectomy in African-American women (abstract). *Am J Epidemiol* 1998;147:S58.

These preliminary analyses suggest that nonmedical factors, namely the region of the U.S. in which a woman lives and her level of education, may play a role in the high rate of early hysterectomy among African-American women.

Kim KS, Adams-Campbell L, Palmer JR, Rosenberg L. Physical activity and high blood pressure: Black Women's Health Study (abstract). *Ethn Dis* 1998;8:272.

Strenuous physical activity in the past year was associated with reduced risk of high blood pressure.

McAlindon T, Felson D, Palmer J, Rosenberg L. Associations of body mass index (BMI), smoking, and alcohol with SLE in the Black Women's Health Study (abstract). *Lupus* 1998;7(S1):70.

In preliminary analyses, lupus was positively related to cigarette smoking, and inversely to alcohol use. The relationship to body mass index was unclear.

Lancaster K, Smiciklas-Wright H, Kumanyika S, Mitchell D, Mauger D, Palmer J. Comparison of characteristics of responders vs. non-responders for 3-day food records in African-American women (abstract). *FASEB J* 1998;12(4) Part I:A525.

Women who provided food records did not differ materially in terms of body mass index, age, education, or region of residence from those who did not provide records.

Kumanyika S, Mauger D, Mitchell D, Smiciklas-Wright H, Palmer JR. Comparison of food diaries vs. 24-hour recalls for food frequency data calibration in Black women (abstract). *Eur J Clin Nutr* 1998;52(2S):S84.

In a diet validation study, food diaries and 24-hour recalls gave similar values for intake of fat, saturated fat, fiber and beta-carotene when adjusted for energy intake.

Rosenberg L, Palmer JR, Rao RS, Adams-Campbell LL. Correlates of postmenopausal female hormone use among Black women in the United States. *Obstet Gynecol* 1998;91:454-8.

The use of menopausal female hormone supplements was highest among women who had had both ovaries removed. Rates were also higher among women who lived in the West, were thin, or had higher levels of education. These findings suggest that factors associated with female hormone use in Black and white women are similar. See discussions of the benefits and risks of female hormone supplements in the January 2002 Newsletter and the January 2003 Newsletter.

## **1995-1997**

Rosenberg L, Palmer JR, Adams-Campbell LL. Postmenopausal female hormone use and venous thromboembolic disease in Black women (letter to the editor). *Am J Obstet Gynecol* 1997;177:1275.

Recent studies suggest that the risk of clots in the legs or lung may be higher among women who are using postmenopausal female hormones than among nonusers. Data from

the BWHS support this possibility. These findings have been confirmed by data from randomized studies.

McAlindon T, Felson D, Palmer J, Zhang Y, Rosenberg L. Associations of cigarette smoking and alcohol with systemic lupus erythematosus (SLE) among participants in the Black Women's Health Study (abstract). *Arthritis Rheum* 1997;40(Suppl):S162.

In preliminary analyses, cigarette smoking was more common and alcohol consumption less common among women who reported having lupus than among women who did not have this condition.

Rosenberg L, Rao RS, Adams-Campbell L, Palmer JR. Risk factors for myocardial infarction among African-American women (abstract). *Am J Epidemiol* 1997;145:S45.

Risk factors for myocardial infarction (heart attack) in Black women have received little study. Cigarette smoking, high blood pressure, diabetes, high cholesterol levels, family history of heart attack, and overweight were associated with a higher risk of heart attack.

Rosenberg L, Adams-Campbell L, Palmer JR. The Black Women's Health Study: a follow-up study for causes and preventions of illness. *J Am Med Womens Assoc* 1995;50:56-8.

Most previous epidemiologic studies have been of white populations. The Black Women's Health Study, a follow-up study, is the largest study of U.S. Black women yet conducted. This paper discusses the study methods. The major aims include identifying risk factors for breast cancer and other cancers. The study will also assess risk factors for a wide range of other serious illnesses that affect Black women, such as high blood pressure, diabetes, uterine fibroids and lupus.

