

Black Women's Health Study Publications

Updated June 24, 2024

2024

Sheehy S, Brock M, Palmer JR, Albert MA, Cozier Y, Rosenberg L. Perceived interpersonal racism in relation to incident coronary heart disease among Black women. *Circulation* 2024;149(7):521-528. doi: 10.1161/CIRCULATIONAHA.123.066471. PMID: PMC10926238.

There has been little research examining whether experiences of interpersonal racism are associated with the risk of coronary heart disease (CHD). Based on data from the Black Women's Health Study, we found a higher risk of CHD among Black women who reported experiences of racism in employment, housing, and with the police than among those who reported no such experiences. We did not find increased risk in relation to perceived racism in everyday life.

Kataria Y, Niharika Pillalamarri B, Zirpoli G, Szalat R, Palmer JR, Bertrand KA. Body size and risk of multiple myeloma in the Black Women's Health Study. *Br J Cancer* 2024;130(5):830-835. doi: 10.1038/s41416-023-02571-w. PMID: PMC10912597.

Obesity is one of the known risk factors for multiple myeloma, a blood cancer. In the BWHS, women with high body mass index (BMI>25) in early adulthood have a 57% increased risk of multiple myeloma. Weight control could be an important in reducing the risk of this disease.

Zirpoli GR, Pfeiffer RM, Bertrand KA, Huo D, Lunetta KL, Palmer JR. Addition of polygenic risk score to a risk calculator for prediction of breast cancer in US Black women. *Breast Cancer Res* 2024;26(1):2. doi: 10.1186/s13058-023-01748-8. PMID: PMC10763003.

Adding a polygenic risk score (PRS) to breast cancer risk prediction models created for European-ancestry populations improved the accuracy of the models. We tested the addition of a polygenic risk score developed for African American women (AA-PRS) to the BWHS risk calculator for incident breast cancer in Black Women. The addition of AA-PRS increased the accuracy of the BWHS risk calculator, and it performs similarly to the models in other populations.

Barnard ME, Wang X, Petrick JL, Zirpoli GR, Jones D, Johnson WE, Palmer JR. Psychosocial stressors and breast cancer gene expression in the Black Women's Health Study. *Breast Cancer Res Treat* 2024;204(2):327-340. doi: 10.1007/s10549-023-07182-w.

Research has shown that the physiologic response to stress can affect gene expression. Based on breast cancer RNA sequencing data in the Black Women's Health Study, the top differentially expressed pathways by stress exposure for ER+ cases were related to RNA and protein metabolism, while among ER- cases, they were related to developmental biology, signal transduction, metabolism, and the immune system. Psychosocial stress may affect breast tumor biology through multiple pathways. Changes

in tumor biology and disease progression in relation to stress is an area for further research.

Timmins IR, Jones ME, O'Brien KM, Adami HO, Aune D, Baglietto L, Bertrand KA, Brantley KD, Chen Y, Clague DeHart J, Clendenen TV, Dossus L, Eliassen AH, Fletcher O, Fournier A, Håkansson N, Hankinson SE, Houlston RS, Joshi CE, Kirsh VA, Kitahara CM, Koh WP, Linet MS, Park HL, Lynch BM, May AM, Mellekjær L, Milne RL, Palmer JR, Ricceri F, Rohan TE, Ruddy KJ, Sánchez MJ, Shu XO, Smith-Byrne K, Steindorf K, Sund M, Vachon CM, Vatten LJ, Visvanathan K, Weiderpass E, Willett WC, Wolk A, Yuan JM, Zheng W, Nichols HB, Sandler DP, Swerdlow AJ, Schoemaker MJ. International pooled analysis of leisure-time physical activity and premenopausal breast cancer in women from 19 cohorts. *J Clin Oncol* 2024;42(8):927-939. doi: 10.1200/JCO.23.01101.

Physical activity has been shown to be strongly associated with decreased risk of postmenopausal breast cancer, but its association with premenopausal breast cancer is uncertain. In a study of data from 19 cohort studies that included 547,601 premenopausal women, high versus low levels of leisure-time physical activity were associated with reduced risk, suggesting that leisure-time physical activity may lower the risk of premenopausal breast cancer.

Ruiz Lopez JN, McNeil GE, Zirpoli G, Palmer JR, Kataria Y, Bertrand KA. Vitamin D and monoclonal gammopathy of undetermined significance (MGUS) among U.S. Black women. *Cancer Causes Control* 2024;35(2):277-279. doi: 10.1007/s10552-023-01798-5. PMID: PMC10872902.

Monoclonal gammopathy of undetermined significance (MGUS) is an asymptomatic precursor to multiple myeloma. Risk factors for MGUS are largely unknown. Hypothesizing that low vitamin D levels might be associated with risk of MGUS, we examined data from the Black Women's Health Study to assess the association of vitamin D deficiency (level of 25(OH)D less than 20 ng/mL) with risk of MGUS. MGUS was more prevalent among women with vitamin D deficiency but results were not statistically significant. Further study is required to clarify the possible association between vitamin D deficiency and MGUS.

Wolfson EA, Schonberg MA, Eliassen AH, Bertrand KA, Shvetsov YB, Rosner BA, Palmer JR, LaCroix AZ, Chlebowski RT, Nelson RA, Ngo LH. Validating a model for predicting breast cancer and non-breast cancer death in women aged 55 and older. *J Natl Cancer Inst* 2024;116(1):81-96. doi: 10.1093/jnci/djad188. PMID: PMC10777669.

The investigative team developed a competing-risk model to estimate 5-year breast cancer risk and 10-year non-breast cancer death from women 55 and older in the Black Women's Health Study, the Women's Health Initiative-Extension Study (WHI-ES), and the Multiethnic Cohort (MEC), as well as comparing the model performance to existing models. Results showed that the newly developed model performs at least as well as existing breast cancer prediction models and also predicts non-breast cancer death.

Cozier YC, Arkema EV. Epidemiology of sarcoidosis. *Clin Chest Med* 2024;45(1):1-13. doi: 10.1016/j.ccm.2023.06.004.

Sarcoidosis can affect any organ but most commonly affects the lung. It is characterized by granuloma formation. The incidence appears to be greater in women than men and in Black women than other women. Obesity appears to be associated with increased risk and smoking with reduced risk. Several types of infection have been associated with increased risk. Identification of risk factors is needed.

2023

Sheehy S, Aparicio HJ, Palmer JR, Cozier Y, Lioutas VA, Shulman JG, Rosenberg L. A longitudinal association between perceived interpersonal racism and incident stroke in U.S. Black women. *JAMA Netw Open* 2023;6(11):e234203. doi: 10.1001/jamanetworkopen.2023.43203. PMID: PMC10638652.

Strokes, including at younger ages, occur more commonly among Black individuals than other racial groups. In the Black Women's Health Study, experiences of interpersonal racism reported in 1997 were assessed in relation to the incidence in strokes occurring subsequently during 22 years of follow-up. The incidence of stroke in women who reported experiences of interpersonal racism involving jobs, housing, or interaction with police was estimated to be more than 30% greater than that among women reporting none of these occurrences. These results suggest that racism may contribute to the greater burden of stroke among Black women.

Bertrand KA, Delp L, Coogan PF, Cozier YC, Lenzy YM, Rosenberg L, Palmer JR. Hair relaxer use and risk of uterine cancer in the Black Women's Health Study. *Environ Res* 2023;239(Pt 1):117228. doi: 10.1016/j.envres.2023.117228. PMID: PMC10842360.

Use of hair relaxers is common among American Black women. Use has been inconsistently linked to risk of estrogen-dependent cancers and other reproductive health conditions. Using data from the Black Women's Health Study, we compared the risk of uterine cancer of among women who never or rarely used hair relaxers to that among women who used them frequently. Long-term use of chemical hair relaxers was associated with increased risk of uterine cancer among postmenopausal women, although not among premenopausal women. The findings suggest that hair relaxer use may be a potentially modifiable risk factor for uterine cancer.

Wang C, Bertrand KA, Trevino-Talbot M, Flynn M, Ruderman M, Cabral HJ, Bowen DJ, Hughes-Halbert C, Palmer JR. Ethical, legal, and social implications (ELSI) and challenges in the design of a randomized controlled trial to test the online return of cancer genetic research results to U.S. Black women. *Contemp Clin Trials* 2023;132. doi: 10.1016/j.cct.2023.107309. PMID: PMC10544717.

Providing results of genetic testing is an important part of precision medicine, but it is critical that patients receive results in a way that adheres to appropriate principles for

conducting health care. For example, providing results should be done with respect for the autonomy of the patient and should cause no harm. We aim to test an alternative way to provide results effectively, ethically, and efficiently to patients who have had genetic testing. We will conduct a randomized controlled trial to compare two methods of providing the opportunity to learn genetic results: a conventional method involving a Board-certified genetic counselor meeting with participants over the telephone, and a self-guided online method with the option for telephone follow-up with a genetic counselor. This study will demonstrate the effectiveness of a model of return of genetic results that could increase access.

Barber LE, Bertrand KA, Sheehy S, White LF, Roy HK, Rosenberg L, Palmer JR, Petrick JL. Aspirin and nonaspirin nonsteroidal antiinflammatory drug use and occurrence of colorectal adenoma in Black American women. *Int J Cancer* 2023;153(12):1978-1987. doi: 10.1002/ijc.34674. PMID: PMC10927007.

Previous research suggests that aspirin use may reduce the occurrence of colorectal neoplasia. Few studies have investigated this relationship among Black Americans, who are disproportionately diagnosed with the condition. Using data from the Black Women's Health Study, we assessed aspirin use in relation to the occurrence of colorectal adenoma. Regular aspirin use was associated with decreased risk of colorectal adenoma, suggesting that aspirin use could be part of a prevention strategy among Black women.

Young KL, Olshan AF, Lunetta K, Graff M, Williams LA, Yao S, Zirpoli GR, Troester M, Palmer JR. Influence of alcohol consumption and alcohol metabolism variants on breast cancer risk among Black women: results from the AMBER consortium. *Breast Cancer Res* 2023;25(1):66. doi: 10.1186/s13058-023-01660-1.

Breast cancer risk increases with moderate to heavy alcohol consumption. Genes involved in the metabolism of ethanol may influence this risk but have not been well studied. Our analysis assessed variants in four genetic regions related to ethanol metabolism in a large sample of Black women in the US. Two genetic variants had significant associations with breast cancer risk, one with both ER- and triple negative breast cancer and the other with triple negative breast cancer. Additional research is needed to confirm these associations.

Petrick JL, Joslin CE, Johnson CE, Camacho TF, Peres LC, Bandera EV, Beeghly-Fadiel A, Bethea TN, Dempsey LF, Guertin K, Harris HR, Moorman PG, Myers E, Ochs-Balcom HM, Rosenow W, Setiawan VW, Wu AH, Schildkraut JM, Rosenberg L. Menopausal hormone therapy use and risk of ovarian cancer by race: the Ovarian Cancer in Women of African Ancestry Consortium. *Br J Cancer* 2023;129(12):1956-1967. doi: 10.1038/s41416-023-02407-7. PMID: PMC10919377.

Most research examining post-menopausal menopausal hormone therapy (MHT) use in relation to risk of ovarian cancer has focused on White women. Using data from the Ovarian Cancer in Women of African Ancestry consortium, we evaluated MHT use and ovarian cancer risk in Black and White women. We found that long-term (≥ 10 years) use

of MHT was associated with increased risk of ovarian cancer in both Black and White women.

Cozier C, Heaton B, Robles Y, Bond J, Garcia R, Coogan P, Rosenberg L. Perceived racism associated with declines in self-rated oral health among U.S. Black women. *Ann Epidemiol* 2023;84:54-59. doi: 10.1016/j.annepidem.2023.05.012. PMID: PMC10525027.

Blacks Americans experience poorer oral health than White Americans. Stress has been associated with both poor oral health and exposure to racism. In a follow-up study of women participating in the Black Women's Health Study, higher levels of perceived racism reported in 2009 were associated with declines in self-rated oral health in the subsequent 10 years.

Harris R, Peres LC, Johnson CE, Guertin KA, Beeghly A, Bandera EV, Bethea TN, Joslin CE, Wu AH, Moorman PG, Ochs-Balcom HM, Petrick JL, Setiawan VW, Rosenberg L, Schildkraut JM, Myers E. Racial differences in the association of endometriosis and uterine leiomyomas with the risk of ovarian cancer. *Obstet Gynecol* 2023;141(6):1124-1138. Doi: 10.1097/AOG.0000000000005191. PMID: PMC10440275.

We evaluated associations of endometriosis and uterine leiomyomas (fibroids) with risk of ovarian cancer by race. We also examined the effect of hysterectomy on these associations. In both Black and White women, a diagnosis of endometriosis was associated with an increased risk of endometrioid and clear-cell ovarian cancer. Among White participants, the association was stronger in those without hysterectomy; no difference in association was observed in Black participants with and without hysterectomy. Among Black and White participants, leiomyomas were associated with an increased risk of ovarian cancer only in those without hysterectomy. Understanding how racial differences affect access to health care and treatment options, such as hysterectomy, may help guide risk reduction strategies.

Anyane-Yeboah A, Buadu MAE, Khalili H, Cozier YC. Epidemiology of inflammatory bowel disease in a cohort of US Black Women. *Inflamm Bowel Dis* 2023;29(10):1517-1523. Doi: 10.1093/ibd/izad049.

The incidence of inflammatory bowel disease (IBD), including ulcerative colitis and Crohn's disease, is increasing in minority populations, but little is known about the epidemiology and disease characteristics in Black women. We assessed the reported incidence of IBD and evaluated the accuracy of self-reported diagnosis among 59,000 Black women enrolled in the Black Women's Health Study in 1995 and followed through 2021. The incidence of IBD was highest in Black women younger than 30 years of age and similar to previously published estimates in US White women. Among respondents to a supplementary questionnaire, the confirmation rate for the reported diagnosis was estimated to be 57%.

Nichols HB, House MG, Yarosh R, Mitra S, Goldberg M, Bertrand KA, Eliassen AH, Giles GG, Jones ME, Milne RL, O'Brien KM, Palmer JR, Sandin S, Willett WC, Yin W, Sandler DP,

Swerdlow AJ, Schoemaker MJ. Hypertensive conditions of pregnancy, preterm birth, and premenopausal breast cancer risk: a premenopausal breast cancer collaborative group analysis. *Breast Cancer Res Treat* 2023;199(2):323-334. doi: 10.1007/s10549-023-06903-5

Prior research has suggested a lower risk of breast cancer among women with preeclampsia (high blood pressure during pregnancy), and a higher risk of breast cancer among women with preterm birth. In this study of premenopausal women, preterm birth was inversely associated with premenopausal breast cancer among women with preeclampsia or gestational hypertension. This suggests that conditions of a pregnancy affect breast cancer risk among women with preterm birth.

Schonberg MA, Wolfson EA, Eliassen AH, Bertrand KA, Shvetsov YB, Rosner BA, Palmer JR, Ngo LH. A model for predicting both breast cancer risk and non-breast cancer death among women > 55 years old. *Breast Cancer Res* 2023;25(1):8. doi: 10.1186/s13058-023-01605-8. PMID: PMC9872276.

Mammography guidelines recommend that providers consult with women ages 75 and older and those with a life expectancy of less than 10 years to make decisions regarding undergoing mammography. However, there is no modeling tool that incorporates breast cancer risk and life expectancy to help with this decision making. Using a breast cancer risk prediction model that was developed in the Nurses' Health Study and in the Black Women's Health Study, a model was developed to predict 10-year risk of death due to causes other than breast cancer and 5-year risk of breast cancer death. This tool can help with decision making around mammography screening.

D'Amico M, Wason S, Cozier YC. Correlates of nephrolithiasis in US Black women: data from the black women's health study. *Urolithiasis* 2023;51(1):29. doi: 10.1007/s00240-022-01391-6.

Kidney stones are a common medical condition. Black women are more likely to experience metabolic conditions, such as obesity and diabetes, that are related to higher risk of kidney stones. In the BWHS, women who reported a history of kidney stones were more likely to be older, overweight, have conditions such as type 2 diabetes or gallstones, drink little or no alcohol, and consume a Western diet. The association of these factors with a kidney stone diagnosis is consistent with other studies.

Sheehy S, Palmer JR, Cozier Y, Bertrand KA, Rosenberg L. Vitamin D and risk of hypertension among Black women. *J Clin Hypertens* 2023;25:168-174. doi: 10.1111/jch.14615. PMID: PMC9903189.

Prior studies have suggested that higher vitamin D levels in the blood are associated with lower risk of hypertension. Black women are more likely to have vitamin D deficiency than women in other racial groups. In the BWHS, using a validated predicted vitamin D score and controlling for confounders, a higher score was weakly associated with lower risk of hypertension.

Barber LE, VoPham T, White LF, Roy HK, Palmer JR, Bertrand KA. Circadian disruption and colorectal cancer incidence in Black women. *Int J Cancer* 2023;32(7):927-935. doi: 10.1158/1055-9965.EPI-22-0808. PMID: PMC10199956

Some studies suggest that circadian disruption—disturbance in natural sleeping and waking cycles—increases colorectal cancer risk among animals, but data from human research is limited. Using data from the BWHS, we examined night shift work, chronotype, and residential position within a time zone, proxies for circadian disruption, in relation to colorectal cancer risk. Compared with never having worked night shifts, working a night shift for more than 10 years was associated with increased risk of colorectal cancer, while shorter durations were not associated with increased colorectal cancer risk. These results require confirmation in larger studies.

Brasky TM, Hade EM, Cohn DE, Newton AM, Petruzella S, O'Connell K, Bertrand KA, Cook LS, De Vivo I, Du M, Freudenheim JL, Friedenreich CM, Goodman MT, Gorzelitz J, Ibiebele TI, Krogh V, Liao LM, Lipworth L, Lu L, McCann S, O'Mara TA, Palmer JR, Ponte J, Prizment A, Risch H, Sandin S, Schouten LJ, Setiawan VW, Shu X, Trabert B, van den Brandt PA, Webb PM, Wentzensen N, Wilkens LR, Wolk A, Yu H, Neuhaus ML. Dietary omega-3 fatty acids and endometrial cancer risk in the Epidemiology of Endometrial Cancer Consortium: an individual-participant meta-analysis. *Gynecol Oncol* 2023;137-146. doi: 10.1016/j.ygyno.2022.10.015. PMID: PMC10025515

Limited data suggest that higher consumption of long-chain omega-3 polyunsaturated fatty acids (LCn3PUFA) may reduce risk of endometrial cancer. Fatty acid intakes from 12 studies participating in the Epidemiology of Endometrial Cancer Consortium, which includes the BWHS, were assessed in relation to endometrial cancer risk. Diets higher in LCn3PUFA were associated with higher risk of endometrial cancer among overweight women but there was no increase among women of normal weight. These results suggest that higher dietary intakes of LCn3PUFA are unlikely to reduce risk of endometrial cancer, but rather might be associated with increases in some subgroups of women.

2022

Davis Lynn BC, Lord BD, Cora R, Pfeiffer RM, Lawrence S, Zirpoli G, Bethea TN, Palmer JR, Gierach GL. Associations between quantitative measures of TDLU involution and breast tumor molecular subtypes among breast cancer cases in the Black Women's Health Study: a case-case analysis. *Breast Cancer Res* 2022;24(1):86. doi: 10.1186/s13058-022-01577-1. PMID: PMC9720909.

Terminal duct lobular units (TDLUs) are the structures in the breast that are the source of most breast cancers. Previous research has shown that typical TDLU metrics can be elevated in the non-cancerous breast tissue of women diagnosed with triple negative (TN) breast cancer as compared to women with other breast cancer subtypes. BWHS data was used to see if this same pattern of elevated TDLU is seen in Black women, who also are more commonly diagnosed with TN breast cancer. Results within the BWHS were found to be consistent with those from prior studies of White and Asian women.

Sponholtz TR, Palmer JR, Rosenberg L, Chen C, Chen Y, Clarke MA, Clendenen T, Du M, Johnson L, Liao LM, Michels KA, O'Connell K, Olson SH, Petruzella S, Rebbeck TR, Setiawan VW, Trabert B, Weiss NS, Wentzensen N, Wilkens L, Wise LA. Risk factors for endometrial cancer in Black women. *Cancer Causes Control* 2022. doi: 10.1007/s10552-022-01653-z

In the US, the incidence of endometrial cancer is increasing fastest among Black women compared to other racial/ethnic groups. In addition, mortality from endometrial cancer among Black women in the US is almost double that of White women. However, few studies have examined risk factors for this cancer in Black women. We found that the risk associated with two established risk factors, menopausal hormone use and severe obesity, were similar to those observed in studies of White women. Our results suggest that associations of two established risk factors for endometrial cancer are similar in Black and White women.

Ochs-Balcom HM, Johnson C, Guertin KA, Qin B, Beeghly-Fadiel A, Camacho F, Bethea TN, Dempsey LF, Rosenow W, Joslin CE, Myers E, Moorman PG, Harris HR, Peres LC, Setiawan VW, Wu AH, Rosenberg L, Schildkraut JM, Bandera EV. Racial differences in the association of body mass index and ovarian cancer risk in the OCWAA Consortium. *Br J Cancer* 2022;127(11):1983-1990. doi: 10.1038/s41416-022-01981-6. PMID: PMC9681872.

Obesity is associated with an increased risk of ovarian cancer, but there is some evidence that the association may differ by race. Using data from the OCWAA Consortium, a group of studies which includes the BWHS, body mass index was assessed in relation to risk of invasive epithelial ovarian cancer (EOC). Results showed a strong association between obesity and risk for non-high-grade serous epithelial ovarian cancer (NHGS EOC) among both Black and White women, but risk across racial groups differed by use of hormone therapy and histotype.

Bethea TN, Dash C, Adams-Campbell LL. A prospective cohort study of physical activity in relation to lung cancer incidence among Black women. *Cancer Epidemiol* 2022;78:102146. doi: 10.1016/j.canep.2022.102146. PMID: PMC9133140.

Black women are at higher risk of lung cancer and lung cancer-related mortality than White women despite having a lower smoking prevalence than White women. Using data from the Black Women's Health Study, we examined physical activity, including vigorous exercise and walking, in relation to lung cancer risk. Women who engaged in vigorous physical activity for more than one hour each week or were in the highest category of energy expenditure from physical activity had a decreased risk of lung cancer. The reduction was present even among smokers.

Heaton B, Bond JC, Bae J, Cozier Y. Perceived experiences of racism linked to dental fear and anxiety among Black women. *Community Dent Oral Epidemiol* 2022;51(5):896-907. doi: 10.1111/cdoe.12782. PMID: PMC9925613

Dental fear and anxiety may cause patients to delay or avoid dental care. However, little is known about dental fear and anxiety among racial and ethnic minority populations, who bear a disproportionate burden of poor oral health. Based on data from 484 BWHS participants from the Greater Boston area, we assessed associations between high dental anxiety, poor oral health outcomes, and experiences of perceived racism. Higher levels of reported exposures to racism were associated with higher dental anxiety, which was in turn associated with poorer oral health outcomes.

Crous-Bou M, Du M, Gunter MJ, Setiawan VW, Schouten LJ, Shu XO, Wentzensen N, Bertrand KA, Cook LS, Friedenreich CM, Gapstur SM, Goodman MT, Ibiebele TI, La Vecchia C, Levi F, Liao LM, Negri E, McCann SE, O'Connell K, Palmer JR, Patel AV, Ponte J, Reynolds P, Sacerdote C, Sinha R, Spurdle AB, Trabert B, van den Brandt PA, Webb PM, Petruzella S, Olson SH, De Vivo I; Epidemiology of Endometrial Cancer Consortium (E2C2). Coffee consumption and risk of endometrial cancer: a pooled analysis of individual participant data in the Epidemiology of Endometrial Cancer Consortium (E2C2). *Am J Clin Nutr* 2022;116(5):1219-1228. doi: 10.1093/ajcn/nqac229. PMID: PMC9630862

Epidemiologic studies suggest that drinking coffee may be associated with a reduced risk of endometrial cancer, possibly due to antioxidants and other chemopreventive compounds found in coffee. Using data from the Epidemiology of Endometrial Cancer Consortium of 19 studies which includes the BWHS, we examined the association between coffee consumption and endometrial cancer risk while also evaluating how other known risk factors for endometrial cancer might modify this effect. Coffee drinking was associated with a reduced risk of endometrial cancer with a stronger association in participants with a higher body mass index

Erhunmwunsee L, Wing SE, Zou X, Coogan PF, Palmer JR, Wong FL. Neighborhood disadvantage and lung cancer risk in a national cohort of never smoking Black women. *Clin Lung Cancer* 2022;173:21-27. doi: 10.1016/j.lungcan.2022.08.022. PMID: PMC9588723.

Compared to women of other races who never smoked, Black female who never smoked are at greater risk for lung cancer, and the reasons are not well understood. Using data from the Black Women's Health Study, we found that neighborhood concentrated disadvantage as well as exposure to secondhand smoke at work were associated with an increased risk of lung cancer among Black women who had never smoked. Further research is necessary to identify and understand the factors responsible for the association with neighborhood.

Nash R, Johnson CE, Harris HR, Peres LC, Joslin CE, Bethea TN, Bandera EV, Ochs-Balcom HM, Myers ER, Guertin KA, Camacho F, Beeghly-Fadiel A, Moorman PG, Setiawan VW, Rosenberg L, Schildkraut JM, Wu AH. Race differences in the associations between menstrual cycle characteristics and epithelial ovarian cancer. *Cancer Epidemiol Biomarkers Prev* 2022;31(8):1610-1620. doi: 10.1158/1055-9965.EPI-22-0115. PMID: PMC9711941.

Characteristics of a woman's menstrual cycle, such as age at first period and cycle length, are associated with ovarian cancer risk in White women but have not been well-studied in

Black women. Using data from the Ovarian Cancer in Women of African Ancestry Consortium, which includes the Black Women's Health Study, young age at first period (<11) and irregular cycle length were associated with increased epithelial ovarian cancer for White women but not for Black women.

Bertrand KA, Zirpoli G, Pillalamarri BN, Szalat R, Palmer JR, Kataria Y. Prevalence of monoclonal gammopathy of undetermined significance (MGUS) in US Black women. *Am J Hematol* 2022;97(9):E341-E343. doi: 10.1002/ajh.26638. PMID: PMC9558112.

Black Americans are twice as likely as non-Hispanic White Americans to be diagnosed with multiple myeloma (MM), and the incidence in both groups has increased in recent years. Monoclonal gammopathy of unknown significance (MGUS) is an asymptomatic precursor condition that occurs in virtually all MM cases. Rates of progression from MGUS to MM do not differ by race; the disparity in incidence of MM by race appears to result from disparity in the incidence of MGUS. The best estimates of the prevalence of MGUS in Black individuals ages 50 and older are based on blood samples collected between 1988-2004. Using International Myeloma Working Group diagnostic criteria and blood samples collected during 2014-2018 from participants in the Black Women's Health Study, we identified MGUS cases and calculated an age-adjusted prevalence of 9.0%, which is higher than the estimates of prevalence previously reported for Black populations.

Gao G, ... Lunetta KL, ... Bertrand K, Zirpoli G, ..., Palmer JR, et al. Polygenic risk scores for prediction of breast cancer risk in women of African ancestry: a cross-ancestry approach. *Hum Mol Genet* 2022;31(18):3133-3143. doi: 10.1093/hmg/ddac102. PMID: PMC9476624.

Commonly used polygenic risk scores (PRSs), which are used to predict breast cancer risk, have relatively low prediction accuracy for women of African ancestry. To improve prediction of breast cancer risk in this population, data from five GWAS (genome-wide association studies) in which women of African ancestry are well-represented was used to create new PRSs. The proposed PRSs were better able to predict overall risk of breast cancer and of estrogen receptor (ER) negative and ER-positive breast cancer for women of African ancestry than existing methods.

Harris H, Guertin K, Camacho F, Johnson C, Wu A, Moorman P, Myers E, Bethea TN, Bandera EV, Joslin C, Ochs-Balcom H, Peres L, Rosenow W, Setiawan V, Beeghly-Fadiel A, Dempsey L, Rosenberg L, Schildkraut J. Racial disparities in epithelial ovarian cancer survival: an examination of contributing factors in the Ovarian Cancer in Women of African Ancestry (OCWAA) consortium. *Int J Cancer* 2022;151(8):1228-39. doi: 10.1002/ijc.34141. PMID: PMC9420829.

Black women have poorer survival from epithelial ovarian cancer than white women. In the Ovarian Cancer in Women of African Ancestry (OCWAA) consortium of seven U.S. studies, we found that college education, nulliparity, smoking status, body mass index, diabetes, postmenopausal female hormone use, histotype, and stage of ovarian cancer accounted for 48.8% of the disparity, with histotype/stage and postmenopausal female

hormone use being most important. The findings suggest that several potentially modifiable factors play a role in the black/white survival disparity, though further research is needed to identify additional mediators and avenues of intervention.

Jordahl KM, ...Palmer JR, et al. Beyond GWAS of colorectal cancer: evidence of interaction with alcohol consumption and putative causal variant for the 10q24.2 region. *Cancer Epidemiol Biomarkers Prev* 2022;31(5):1077-89. doi: 10.1158/1055-9965.EPI-21-1003

Risk of colorectal cancer has known associations with common genetic variants, but these associations explain less than half of its heritability. Nondrinking and heavy consumption of alcohol are both associated with a higher risk of colorectal cancer. Using data from the Colon Cancer Family Registry, Colorectal Transdisciplinary Study, and Genetics and Epidemiology of Colorectal Cancer Consortium, we compared nondrinkers and heavy drinkers with light-to-moderate drinkers in Genotype by Environment (GxE) analyses to search for evidence of interaction between alcohol consumption and genetic variants. Our findings suggest that the previously observed association between colorectal cancer and one of the genetic variants is strongest in nondrinkers. Our study also identified a second variant as the putative causal regulatory variant for the region.

Díaz-Zabala H, Guo X, Ping J, Wen W, Shu XO, Long J, Lipworth L, Li B, Fadden MK, Pal T, Blot WJ, Cai Q, Haiman CA, Palmer JR, Sanderson M, Zheng W. Evaluating breast cancer predisposition genes in women of African ancestry. *Genet Med* 2022;24(7):1468-1475. doi: 10.1016/j.gim.2022.03.015. PMID: PMC9597482.

Twelve genes predisposing to breast cancer have been identified in studies conducted primarily among women with European ancestry, but the roles of these genes have been less well-investigated among women of African ancestry. We conducted a case-control study in African American women to estimate the associations of these genes with breast cancer risk. The study confirmed previously identified genes associated with breast cancer risk (BRCA1, BRCA2, PALB2, ATM, TP53, NF1, and CHEK2) and also provided new evidence to associate risk in Black women with genes RAD51C and RAD51D.

Zhou ES, Ritterband LM, Bethea TN, Robles YP, Heeren TC, Rosenberg L. Effect of culturally tailored, internet-delivered cognitive behavioral therapy for insomnia in Black women: a randomized clinical trial. *JAMA Psychiatry* 2022;79(6):538-49. doi: 10.1001/jamapsychiatry.2022.0653. PMID: PMC9021979.

Black women are at high risk for insomnia disorder, but there has been limited research to investigate the efficacy of cognitive behavioral therapy for insomnia (CBT-I) in treating insomnia in this population. Participants in the BWHS who had been identified as experiencing elevated insomnia symptoms were recruited to participate in a randomized clinical trial to compare the efficacy of a standard version of an internet-delivered CBT-I program (SHUTi), a culturally tailored version (SHUTi-BWHS), and a patient education control program (PE) at improving insomnia symptoms. Findings show that both SHUTi and SHUTi-BWHS decreased insomnia severity and improved sleep

outcomes more than PE, and that a higher proportion of SHUTi-BWHS than of SHUTi participants completed the full program, suggesting that the modified program was more effective at keeping participants engaged. Those who completed the program had the greatest improvements in their sleep.

Bigham Z, Robles Y, Freund KM, Palmer JR, Bertrand KA. Hypertensive diseases of pregnancy and risk of breast cancer in the Black Women's Health Study. *Breast Cancer Res Treat* 2022;194(1):127-35. doi: 10.1007/s10549-022-06606-3. PMID: PMC9190198.

Black women have a higher risk of developing hypertensive diseases of pregnancy (HDOP) such as preeclampsia and gestational hypertension, and a higher incidence of aggressive breast cancer subtypes. We followed 42,982 parous women in the Black Women's Health Study to examine the relation of self-reported HDOP to breast cancer incidence overall and by estrogen receptor (ER) status. There was no association between a history of HDOP and breast cancer risk overall. A suggestive inverse association with ER- breast cancer may reflect an anti-tumorigenic hormone profile in HDOP, but this association requires confirmation in other studies.

Bethea TN, Dash C, Adams-Campbell LL. A prospective cohort study of physical activity in relation to lung cancer incidence among Black women. *Cancer Epidemiol* 2022. doi: 10.1016/j.canep.2022.102146

Despite a lower smoking prevalence, Black women experience higher lung cancer incidence and mortality than White women. Because physical activity has effects on immune and inflammatory systems and sex hormones and metabolism that might reduce risk, we examined vigorous exercise, walking for exercise, and sitting watching television in relation to lung cancer risk in the BWHS. Based on data among 38,432 participants, there was some evidence of a reduced risk of lung cancer for participants who exercised vigorously and an increased risk for those who sat and watched television. Results from previous studies have been inconsistent. Future research is needed to more clearly establish the effect of exercise on lung cancer risk and understand the biologic mechanisms involved.

Lowry KP, Geuzinge HA, Stout NK, Alagoz O, Hampton J, Kerlikowske K, de Koning HJ, Miglioretti DL, van Ravesteyn NT, Schechter C, Sprague BL, Tosteson ANA, Trentham-Dietz A, Weaver D, Yaffe MJ, Yeh JM, Couch FJ, Hu C, Kraft P, Polley EC, Mandelblatt JS, Kurian AW, Robson ME; Breast Working Group of the Cancer Intervention and Surveillance Modeling Network (CISNET), in collaboration with the Breast Cancer Surveillance Consortium (BCSC), and the Cancer Risk Estimates Related to Susceptibility (CARRIERS) Consortium. Breast cancer screening strategies for women with ATM, CHEK2, and PALB2 pathogenic variants: a comparative modeling analysis. *JAMA Oncol* 2022;8(4):587-96. doi: 10.1001/jamaoncol.2021.6204. PMID: PMC8855312.

Screening mammography and magnetic resonance imaging (MRI) are recommended for women with ATM, CHEK2, and PALB2 pathogenic variants, but there is little data to guide screening regimens for these women. Using two established breast cancer

microsimulation models from the Cancer Intervention and Surveillance Modeling Network (CISNET), benefits and harms of breast cancer screening strategies involving mammography and MRI at various start ages were compared. Results suggest that annual MRI screening starting at age 30 to 35 followed by annual MRI and mammography at age 40 may reduce breast cancer mortality by more than 50% for women with pathogenic variants. Results also suggest that if a patient is already receiving annual MRI screening, there may be little benefit to mammography prior to age 40.

Bethea TN, Cozier YC. The Black Women's Health Study: working together to improve the health of Black women. In: Evans SY, Davis SK, Hinkson LR, and Wathington DJ, eds. *Black Women and Public Health: Strategies to Name, Locate, and Change Systems of Power*. 1st ed. Albany, NY: SUNY Press, 2022:101-24.

Black Women and Public Health discusses issues of race, gender, and health. Grounded in the lived experiences and expertise of Black women, this collection bridges gaps between researchers, practitioners, educators, and advocates. The three dozen authors offer analysis, critique, and recommendations for overcoming longstanding and contemporary challenges to equity in public health practices.

Wu Y, Palmer JR, Rosenberg L, Ruiz-Narváez EA. Admixture mapping of anthropometric traits in the Black Women's Health Study: evidence of a shared African ancestry component with birth weight and type 2 diabetes. *J Hum Genet* 2022;67(6):331-8. doi: 10.1038/s10038-022-01010-7.

In the U.S., obesity, type 2 diabetes, and low birth weight are all more prevalent among Black women than White women, and the reasons why are not well understood. Using data from the Black Women's Health Study, we conducted admixture mapping of body mass index (BMI) at age 18, adult BMI, and adult waist circumference, and waist-to-hip ratio adjusted for BMI. We searched for evidence of shared African genetic ancestry components among the four anthropometric traits and among birth weight and type 2 diabetes. Findings show that global percent African ancestry was associated with higher adult BMI, and shared ancestry analysis identified local African ancestry regions associated with multiple traits. Findings for one genomic region are consistent with the fetal insulin hypothesis, which suggests that low birth weight and type 2 diabetes have a common genetic basis. Further research is needed to identify the actual genetic variants responsible for the clustering of these conditions in African Americans.

Yiannakou I, Barber LE, Adams-Campbell L, Li S, Palmer JR, Rosenberg L, Petrick JL. A prospective analysis of red and processed meat intake in relation to colorectal cancer in the Black Women's Health Study. *J Nutr* 2022;152(5):1254-62. doi: 10.1093/jn/nxab419. PMID: PMC9071344.

Black Americans are at higher risk from colorectal cancer (CRC) than any other racial/ethnic group in the United States. Consumption of red and processed meats is associated with an increased risk of CRC in White populations, but three prior studies in Black populations reported no association. Using data from the Black Women's Health Study, we assessed intakes of processed and unprocessed red meat, saturated fatty acids

(SFAs) and monounsaturated fatty acids (MUFAs) in relation to CRC risk. Results show that unprocessed red meat intake was associated with a 2-fold increase in CRC risk. These findings are the first positive evidence that red meat plays a role in the etiology of CRC in Black women, and they also suggest opportunities for prevention.

Cozier YC, Arkema EV, Rodriguez JV, Berman JS, Govender P. Epidemiology: solving the jigsaw puzzle. In: Bonella F, Culver DA, Israel-Biet D, eds. Sarcoidosis (ERS Monograph). 2nd ed. Sheffield: European Respiratory Society, 2022:8-24.

Recent reports indicate that the prevalence of sarcoidosis is rising and mortality in chronic sarcoidosis patients is increasing. There is a need for clinicians to have a working knowledge of the clinical manifestations and multi-system involvement of sarcoidosis. This Monograph provides a comprehensive overview of sarcoidosis, including history, epidemiology and pathobiology, specific organ manifestations, traditional and innovative treatment strategies, and patient quality-of-life assessment.

Townsend MK, ... Palmer JR, ... Rosenberg L, et al. Cohort Profile: The Ovarian Cancer Cohort Consortium (OC3). *Int J Epidemiol* 2022;51(3):e73-86. doi: 10.1093/ije/dyab211.

The Ovarian Cancer Cohort Consortium (OC3), an international collaboration that includes deidentified data from 21 cohort studies, enables research on risk factors, biomarkers, outcomes and risk prediction of ovarian cancer and its subtypes. With data on a wide variety of exposure and outcomes from 1.3 million women, the consortium is a powerful tool for advancing knowledge. The BWHS is included in this Consortium.

Petrick JL, Wilkinson JE, Michaud DS, Cai Q, Gerlovín H, Signorello LB, Wolpin BM, Ruiz-Narvaez EA, Long J, Yang Y, Johnson WE, Shu X, Huttenhower C, Palmer JR. The oral microbiome in relation to pancreatic cancer risk in African Americans. *Br J Cancer* 2022;126(2):287-96. doi: 10.1038/s41416-021-01578-5.

Black Americans have the highest incidence of pancreatic cancer of any racial/ethnic group in the US. The oral microbiome has been associated with increased risk of pancreatic cancer in a recent study. In a study that included BWHS participants in which we assessed the oral microbiome to risk of pancreatic cancer, there was no association between the microbiome and risk.

Gathirua-Mwangi WG, Palmer JR, Champion V, Castro-Webb N, Stokes AC, Adams-Campbell L, Marley AR, Forman MR, Rosenberg L, Bertrand KA. Maximum and time-dependent Body Mass Index and breast cancer incidence among postmenopausal women in the Black Women's Health Study. *Am J Epidemiol* 2022;191(4):646-54. doi: 10.1093/aje/kwac004. PMID: PMC9077111.

Excess weight is a known risk factor for postmenopausal breast cancer. We evaluated maximum body mass index (BMI, a weight-for-height measurement) and BMI at several timepoints prior to breast cancer diagnosis to evaluate whether the increased risk was related to excess weight (BMI \geq 35) at a particular point in time. Maximum BMI and

time-dependent BMI ≥ 35 were both strongly associated with postmenopausal ER+ breast cancer risk, suggesting that risk is increased regardless of timing.

Yusufov M, Recklitis C, Zhou E, Bethea TN, Rosenberg L. A population-based psychometric analysis of the Insomnia Severity Index in Black women with and without a history of cancer. *J Sleep Res* 2022;31(1):e13421. doi: 10.1111/jsr.13421.

The Insomnia Severity Index (ISI) is a commonly used tool to identify sleep disruption. However, its validity has not been tested in Black women and there has been little testing in cancer survivors. The ISI was included on the BWHS health questionnaire in 2015. Based on the data of 29,500 BWHS participants who completed the ISI, we found that internal consistency reliability was high in participants with and without a history of cancer. We found a one-factor model had the best fit to the data but the model was not robust. Assessment in other large studies is needed.

2021

Potter AL, Yang CJ, Woolpert KM, Puttaraju T, Suzuki K, Palmer JR. Evaluating eligibility of US Black women under USPSTF lung cancer screening guidelines. *JAMA Oncol* 2021;8(1):163-4. doi: 10.1001/jamaoncol.2021.5790. PMID: PMC8777560.

The 2021 US Preventive Services Task Force (USPSTF) lung cancer screening guidelines were changed to increase the number of smokers eligible for screening by lowering the age eligibility from 55 to 50 years and reducing the required pack-years of smoking from 30 to 20. While these changes should increase the proportion of Black individuals eligible for screening, many high-risk Black women may continue to be ineligible. Using data from the Black Women's Health Study, we evaluated lung cancer screening eligibility among American Black women under the 2013 and 2021 USPSTF guidelines. Results show that the proportion of Black women diagnosed with lung cancer who would have been eligible for screening increased by 50% under 2021 USPSTF screening guidelines compared with 2013 guidelines, yet two-thirds of the patients with lung cancer still would have been ineligible for screening. Our findings suggest that removing the screening criteria that former smokers must have quit smoking within the past 15 years may benefit Black women.

Yadav S, ..., Palmer JR, et al. Germline pathogenic variants in cancer predisposition genes among women with invasive lobular carcinoma of the breast. *J Clin Oncol* 2021;39(35):3918-26. doi: 10.1200/JCO.21.00640.

The contribution to invasive lobular carcinoma (ILC) of the breast of pathogenic variants (PVs) in the genes that are included in hereditary cancer testing panels were determined. PVs in some genes (ATM, BRCA2, CDH1, CHEK2, PALB2) were associated with increased risk of ILC; PVs in BRCA1 were not. It may be appropriate for those with ILC to have multigene panel testing, as it is for IDC (invasive ductal carcinoma).

Shields AE, Zhang Y, Argentieri MA, Warner ET, Cozier YC, Liu C, Dye CK, Kent BV, Baccarelli AA, Palmer JR. Stress and spirituality in relation to HPA axis gene methylation among US Black women: results from the Black Women's Health Study and the Study on Stress, Spirituality and Health. *Epigenomics* 2021. 2021 Nov;13(21):1711-1734. doi: 10.2217/epi-2021-0275. Epub 2021 Nov 2.

We examined the association between 10 psychosocial stressors and DNA methylation of four stress-related genes among in Black women. We also examined whether religiosity or spirituality modified the DNA methylation (DNAm) of the same stress-related genes. DNA methylation is a normal biological process that regulates gene expression. Observed associations were not statistically significant and therefore show limited evidence of strong interaction in this population.

Barber LE, Zirpoli GR, Cozier YC, Rosenberg L, Petrick JL, Bertrand KA, Palmer JR. Neighborhood disadvantage and individual-level life stressors in relation to breast cancer incidence in U.S. Black women. *Breast Cancer Res* 2021;23(1):108. doi: 10.1186/s13058-021-01483-y.

There has been little assessment of the relation of psychosocial stress to risk of breast cancer subtypes in Black women. In the BWHS, we derived scores for level of neighborhood disadvantage and of socioeconomic status, based on U.S. census data on education, employment, income, poverty, female-headed households, and race. We found that both neighborhood disadvantage and lower neighborhood socioeconomic status were associated with increased risk of estrogen receptor negative breast cancer. Future studies are needed to understand these associations, such as whether particular biologic responses to chronic stress are involved.

Barber LE, Bertrand KA, Petrick JL, Gerlovin H, White LF, Adams-Campbell LL, Rosenberg L, Roy HK, Palmer JR. Predicted vitamin D status and colorectal cancer incidence in the Black Women's Health Study. *Cancer Epidemiol Biomarkers Prev* 2021;30(12):2334-41. doi: 10.1158/1055-9965.EPI-21-0675.

Low vitamin D levels have been linked to increased risk of colorectal cancer in studies of White populations. Black Americans have lower levels of vitamin D and experience higher rates of colorectal cancer than other populations. Using a predicted vitamin D score developed and validated in the BWHS, we evaluated predicted vitamin D levels in relation to colorectal cancer risk among BWHS participants. Women with low predicted vitamin D scores had a higher risk of colorectal cancer than those with the higher scores, suggesting that low vitamin D levels may be a factor in the higher rates of colorectal cancer among Black Americans.

Palmer JR, Zirpoli G, Bertrand KA, Battaglia T, Bernstein L, Ambrosone CB, Bandera EV, Troester MA, Rosenberg L, Pfeiffer RM, Trinquart L. A validated risk prediction model for breast cancer in U.S. Black women. *J Clin Oncol* 2021;39(34):3866-77. doi: 10.1200/JCO.21.01236.

Identifying women at high risk for breast cancer enables appropriate screening for early detection, targeted intervention, and enrollment in preventive trials. We developed a new breast cancer prediction tool for Black women, designed for use in primary care settings, that performs as well as breast cancer prediction tools developed for White women. The tool for Black women has better prediction among women under 40 years of age than among older Black women. Breast cancer prediction among young Black women is particularly useful because younger women with an increased risk of breast cancer are below the usual ages at which breast cancer screening typically begins.

Petrack JL, Barber LE, Warren Andersen S, Florio AA, Palmer JR, Rosenberg L. Racial disparities and sex differences in early- and late-onset colorectal cancer incidence, 2001-2018. *Front Oncol* 2021;11:734998. doi: 10.3389/fonc.2021.734998.

A worldwide increase in colorectal cancer (CRC) incidence at younger ages prompted a look at early and late onset disease in the US. There has been an increase in early-onset colorectal cancer in Whites, which has decreased the disparity in incidence of the disease between Blacks and Whites. There has also been an increase in colorectal neuroendocrine tumors in Blacks. The highest rates of CRC (early- and late- onset) are among Blacks and American Indians/Alaskan Natives.

Chen Z, Guo X, Long J, Ping J, Li B, Fadden MK, Ahearn TU, Stram DO, Shu XO, Jia G, Figueroa J, Ghana Breast Health Study Team, Palmer JR, Sanderson M, Haiman CA, Blot WJ, Garcia-Closas M, Cai Q, Zheng W. Discovery of structural deletions in breast cancer predisposition genes using whole genome sequencing data from > 2000 women of African-ancestry. *Hum Genet* 2021;140(10):1449-57. doi: 10.1007/s00439-021-02342-8.

This study identified structural deletions in several suspected breast cancer predisposition genes in samples from women of African ancestry. This is the first large-scale study to characterize the deletions, and if future studies confirm the findings it may inform future genetic testing for breast cancer.

Warner ET, Kent BV, Zhang Y, Argentieri MA, Rowatt WC, Pargament K, Koenig HG, Underwood L, Cole SA, Daviglius ML, Kanaya AM, Palmer JR, Huang T, Blais MA, Shields AE. "The Study on Stress, Spirituality, and Health (SSSH): Psychometric Evaluation and Initial Validation of the SSSH Baseline Spirituality Survey". *Religions (Basel)* 2021;12(3):150. doi: 10.3390/rel12030150.

A baseline Spiritual Survey (SS-1) was developed and validated in a racially and ethnically diverse sample. The survey showed construct and predictive validity and was well correlated with other measures. The scales produced by the SS-1 were associated with attitudes about religion and spirituality and with some measures of mental health and physical health.

Bitsie KR, Cheng TD, McCann SE, Zirpoli G, Yao S, Bandera EV, Kolonel LN, Rosenberg L, Olshan AF, Palmer JR, Ambrosone CB. Dietary vitamin A and breast cancer risk in Black

women: The African American Breast Cancer Epidemiology and Risk (AMBER) Consortium. *J Nutr* 2021;151(12):3725-37. doi: 10.1093/jn/nxab278.

Prior studies have shown an inverse association between dietary vitamin A intake and breast cancer risk among premenopausal women of European descent. In a study of Black women that included BWHS participants, we found similar results--higher dietary intake of vitamin A was associated with lower incidence of ER-positive breast cancer.

Bertrand KA, O'Brien KM, Wright LB, Palmer JR, Blot WJ, Eliassen AH, Rosenberg L, Sandin S, Tobias D, Weiderpass E, Zheng W, Swerdlow AJ, Schoemaker MJ, Nichols HB, Sandler DP. Gestational diabetes and risk of breast cancer before age 55. *Int J Epidemiol* 2021;50(6):1936-47. doi: 10.1093/ije/dyab165.

There are conflicting results about whether gestational diabetes mellitus (GDM, diabetes during pregnancy) is associated with the risk of breast cancer before age 55. In an assessment of GDM in relation to breast cancer risk in five studies, including the BWHS, we found that women with at least one birth who had a history of GDM had a risk of breast cancer similar to that of women with at least one birth who did not have a history of GDM. There is a well-established decrease in risk of ER-positive breast cancer among women with at least one birth, and in this study women with a history of GDM also showed a decreased risk of ER-positive breast cancer, suggesting that the protective effect of childbearing is not affected by GDM.

Cozier YC, Castro-Webb N, Hochberg NS, Rosenberg L, Albert MA, Palmer JR. Lower serum 25(OH)D levels associated with higher risk of COVID-19 infection in U.S. Black women. *PLoS ONE* 2021;16(7):e0255132. doi: 10.1371/journal.pone.0255132.

Limited evidence suggests that higher blood levels of vitamin D may be protective against COVID-19 infection. Black women often have insufficient vitamin D levels, and they are more likely to become infected with COVID-19 than white women. In a study conducted within the BWHS, lower blood vitamin D levels were associated with a higher risk of COVID-19 infection. Studies are needed to confirm this association in other populations and to determine the optimum level of vitamin D needed to prevent infection.

Sribenja S, Maguire O, Attwood K, Buas MF, Palmer JR, Ambrosone CB, Higgins MJ. Deletion of *Foxa1* in the mouse mammary gland results in abnormal accumulation of luminal progenitor cells: a link between reproductive factors and ER-/TNBC breast cancer? *Am J Cancer Res* 2021;11(6):3263-70.

It has been shown that the risk of estrogen receptor-negative (ER-) breast cancer is higher among those who have given birth; breastfeeding mitigates the increased risk. Exploring the hypothesis that normal suppression of the *FOXA1* gene during pregnancy results in cellular changes in the breast that increase risk of ER- tumors, deletion of the *FOXA1* gene in mouse mammary glands resulted in cellular changes consistent with this hypothesis. These observations provide a possible mechanism for the observed association of pregnancy and ER- tumors.

Boddicker NJ, ..., Palmer JR, ..., Bertrand KA, et al. Risk of late-onset breast cancer in genetically predisposed women. *J Clin Oncol* 2021;39(31):3430-40. doi: 10.1200/JCO.21.00531.

In a study that included women with and without breast cancer from the BWHS and multiple other studies, the goal was to establish the frequency of pathogenic variants (PVs) and remaining risk of breast cancer for each gene linked to breast cancer risk in women 65 and over. Results suggested that all women who are diagnosed with triple-negative breast cancer or with ER-negative breast cancer should receive genetic testing. Those women who test positive for certain breast cancer genes and PVs who are also over age 65 should be considered for magnetic resonance image screening.

Lo CH, ..., Cozier YC, Rosenberg L, ... Palmer JR et al. Race, ethnicity, community-level socioeconomic factors, and risk of COVID-19 in the United States and the United Kingdom. *EClinicalMedicine* 2021;38:101029. doi: 10.1016/j.eclinm.2021.101029.

A study of over two million individuals in the U.S. and the United Kingdom has been in progress since March of 2020 to assess factors related to COVID-19 infection. Participants from many studies, including the BWHS, were invited to join the study and to provide information on factors that might be related to COVID-19 infection and on whether they had become infected. There was an increased risk of COVID-19 infection associated with living in communities identified as more deprived (according to the Neighborhood Deprivation Index and the Index of Multiple Deprivation). The higher risk of COVID-19 infection among racial and ethnic minorities demonstrates the critical role of social determinants of health, such as the circumstances in which people live.

Gao C, ..., Palmer JR, et al. Risk of breast cancer among carriers of pathogenic variants in breast cancer predisposition genes varies by polygenic risk score. *J Clin Oncol* 2021;39(23):2564-73. doi: 10.1200/JCO.20.01992.

This study examined the association of pathogenic variants (PVs) in genes that are associated with an increased risk of breast cancer and polygenic risk scores (PRS) with breast cancer in the general population. Among those who carry PVs in breast cancer predisposition genes, PRS improved personalization of breast cancer risk. Adding PRS may help to prevent over-screening and may enable a breast cancer risk management plan that is more personalized.

Castro-Webb N, Cozier YC, Barbhaiya M, Ruiz-Narváez EA, Li S, Costenbader KH, Rosenberg L. Association of macronutrients and dietary patterns with risk of systemic lupus erythematosus in the Black Women's Health Study. *Am J Clin Nutr* 2021;114(4):1486-94. doi: 10.1093/ajcn/nqab224.

We assessed dietary intake in relation to risk of systemic lupus erythematosus (SLE), a condition that disproportionately affects Black women. Most prior studies examining dietary intake in relation to SLE risk have been in White populations and have been null. Using self-reported diet information, this analysis suggests an increased risk of SLE among Black women whose diet is high in carbohydrates and low in fats.

Graff M, ..., Palmer J, ...et al. Discovery and fine-mapping of height loci via high-density imputation of GWASs in individuals of African ancestry. *Am J Hum Genet* 2021;108(4):564-82. doi: 10.1016/j.ajhg.2021.02.011.

Genetic loci (specific locations on genes) that are associated with height have been identified in populations of European ancestry, but few studies have been conducted among individuals of African ancestry. The present study examined populations with African ancestry based on data from over 50,000 African ancestry individuals as well as published data on European ancestry populations. Many new genetic loci linked to height were found in both the African ancestry and the European ancestry data.

Coogan PF, Rosenberg L, Palmer JR, Cozier YC, Lenzy YM, Bertrand KA. Hair product use and breast cancer incidence in the Black Women's Health Study. *Carcinogenesis* 2021;42(7):924-30. doi: 10.1093/carcin/bgab041.

Black women commonly use hair relaxers and leave-in conditioners and oils. Some of these products contain estrogens or estrogen-disrupting compounds, which might contribute to breast cancer risk. We assessed the use of these products in relation to breast cancer in the BWHS. There was no association between conditioner use and breast cancer. For hair relaxers, there was a possible increased risk of breast cancer associated with frequent use of products containing lye, but there was no association of increased risk with non-lye products. More research is needed to firmly establish the relationship between hair relaxers and breast cancer.

Davis CP, Bandera EV, Bethea TN, Camacho TF, Joslin CE, Wu AH, Beeghly-Fadiel A, Moorman PG, Myers E, Ochs-Balcom HM, Peres LC, Rosenow WT, Setiawan VW, Rosenberg L, Schildkraut JM, Harris HR. Genital powder use and risk of epithelial ovarian cancer in the Ovarian Cancer in Women of African Ancestry Consortium. *Cancer Epidemiol Biomarkers Prev* 2021;30(9):1660-8. doi: 10.1158/1055-9965.EPI-21-0162.

Studies of genital powder use and ovarian cancer risk have been conducted in predominantly White populations, although genital powder use has been more common among Black women. Using data from the Ovarian Cancer in Women of African Ancestry consortium, which includes the BWHS, we found genital powder use to be associated with increased risk of ovarian cancer among both Black and White women.

Wesselink AK, Rosenberg L, Wise LA, Jerrett M, Coogan PF. A prospective cohort study of ambient air pollution exposure and risk of uterine leiomyomata. *Hum Reprod* 2021;36(8):2321-30. doi: 10.1093/humrep/deab095.

Two epidemiologic studies have found positive associations between air pollution exposure and uterine leiomyomata (UL) risk, but neither included large numbers of Black women. UL, also known as uterine fibroids, are a type of benign uterine tumor that occurs more commonly among Black women. Using data from the BWHS, we assessed whether three types of air pollution-- particulate matter <2.5 microns (PM2.5), nitrogen dioxide (NO2) and ozone (O3) -- are associated with risk of UL. PM2.5 and NO2 were

not appreciably associated with UL.O3 concentrations were associated with increased UL risk, with a stronger association among women <35 years and parous women. These findings require confirmation.

Domchek SM, Yao S, Chen F, Hu C, Hart SN, Goldgar D, Nathanson KL, Ambrosone C, Haiman C, Couch FJ, Polley EC, Palmer JR, and the CARRIERS Consortium. Comparison of the prevalence of pathogenic variants in cancer susceptibility genes in Black women and non-Hispanic White women with breast cancer in the United States. *JAMA Oncol* 2021;7(7):1045-50. doi: 10.1001/jamaoncol.2021.1492 PMID: PMC8160931.

Germline pathogenic variants (PV) are inherited genetic mutations. This large study examined the differences in prevalence of 12 breast cancer susceptibility genes in Black women with breast cancer and non-Hispanic White women with breast cancer in the US. There were no differences between the two populations, suggesting that policy regarding genetic testing recommendations does not need to be changed at this time. Efforts should be made to promote equal access to and uptake of genetic testing.

Du Z, Gao G, ..., Zirpoli G, ..., Palmer JR, et al. Evaluating polygenic risk scores for breast cancer in women of African ancestry. *J Natl Cancer Inst* 2021;113(9):1168-76. doi: 10.1093/jnci/djab050.

Polygenic risk score (PRS) summarize the estimated effect of many genetic variants on an individual's predisposition for a given trait or medical condition. PRSs have been demonstrated to identify women of European, Asian, and Latino ancestry at elevated risk of developing breast cancer. In a multi-study analysis, the performance of existing PRSs predicted breast cancer risk among women of African ancestry less well than among other racial/ethnic groups. More work is needed to improve breast cancer risk prediction among Black women.

Sarnowski C, Cousminer DL, Franceschini N, Raffield LM, Jia G, Demerath EW, Fernández-Rhodes L, Grant SFA, Hakonarson H, Lange LA, Long J, Sofer T, Tao R, Wallace RB, Wong Q, Zirpoli G, Boerwinkle E, Bradfield JP, Correa A, Kooperberg CL, North KE, Palmer JR, Zemel BS, Zheng W, Murabito JM, Lunetta KL. Large trans-ethnic meta-analysis identifies AKR1C4 as a novel gene associated with age at menarche. *Hum Reprod* 2021;36(7):1999-2010. doi: 10.1093/humrep/deab086. PMID: PMC8213450.

Age at menarche (AAM, or age at first period) is associated with health outcomes over the lifetime and varies by race and ethnicity. Most genome-wide association studies (GWAS) that identify loci (locations on genes) linked to AAM have been conducted in European ancestry populations. By conducting a GWAS study on a large population of women with predominantly non-European ancestry, we were able to identify a new AMM locus that is more frequent in African-ancestry participants. These results support the need to study a wide range of ancestries and ethnicities to better identify genetic variants associated with diseases or traits.

Wu Y, ... Palmer JR, et al. Dairy foods, calcium, and risk of breast cancer overall and for subtypes defined by estrogen receptor status: a pooled analysis of 21 cohort studies. *Am J Clin Nutr* 2021;114(2):450-61. doi: 10.1093/ajcn/nqab097.

Results on the relationship between consumption of specific dairy products and calcium and risk of breast cancer have been inconclusive. Combining the data of over 1 million women, including 37,861 with breast cancer, associations were evaluated for dairy product and calcium intake with risk of breast cancer overall and estrogen receptor (ER) status subtypes. Adult dairy and calcium consumption was weakly if at all associated with risk of breast cancer overall or breast cancer subtypes. However, higher intake of yogurt and cottage/ricotta cheese was inversely associated with the risk of ER-negative breast cancer.

Shafir AL, Wise LA, Palmer JR, Shuaib ZO, Katuska LM, Vinayak P, Kvaskoff M, Terry KL, Missmer SA. Validity of self-reported endometriosis: a comparison across four cohorts. *Hum Reprod* 2021;36(5):1268-78. doi: 10.1093/humrep/deab012.

Because medical records for endometriosis are both difficult to obtain and not standardized, epidemiologic studies have relied on self-report. Using data from four different cohort studies including the BWHS, we compared questionnaire-reported endometriosis with medical records. For women's self-report of endometriosis, the overall confirmation rate was > 70%, while the confirmation rate was >94% for self-report of laparoscopic confirmation. Relying on self-report appears to be valid; however, standardization in clinical and surgical data documentation would be needed to obtain the details for subgrouping patients.

Boynton-Jarrett R, Sponholtz TR, Rosenberg L, Palmer JR, Bethea TN, Wise LA. Abuse in childhood and risk for sleep disruption in adulthood in the Black Women's Health Study. *Sleep Med* 2021;83:260-70. doi: 10.1016/j.sleep.2021.02.053.

We assessed the relation of early life physical and sexual abuse to several measures of disrupted sleep, including sleep quality and low sleep duration, in the BWHS. Abuse in childhood or teenage years was associated with sleep disruption in adulthood.

Bethea TN, Ochs-Balcom HM, Bandera EV, Beeghly-Fadiel A, Camancho F, Chyn D, Cloyd EK, Harris HR, Joslin CE, Myers E, Moorman PG, Peres LC, Rosenow W, Setiawan VW, Wu AH, Rosenberg L, Schildkraut JM. First- and second-degree family history of ovarian and breast cancer in relation to risk of invasive ovarian cancer in African American and White women. *Int J Cancer* 2021;148(12):2964-73. doi: 10.1002/ijc.33493.

Family history of ovarian cancer and breast cancer are well-established risk factors for ovarian cancer. Based on data from the Ovarian Cancer in Women of African Ancestry Consortium which includes the BWHS, first-degree family history of ovarian cancer was more strongly associated with high-grade serous carcinoma than with other histotypes in Black and White women. The association of second-degree family history of cancer with risk of ovarian cancer may differ by race.

Adedokun B, ..., Palmer JR, et al. Cross-ancestry GWAS meta-analysis identifies six new loci for breast cancer in women of African and European ancestry. *Nat Commun* 2021;12(1):4198. doi: 10.1038/s41467-021-24327-x. PMID: PMC8263739.

Using a cross-ancestry genome-wide association study (GWAS) approach, we identified six new gene loci [locations on genes] that are associated with risk of breast cancer overall or of estrogen receptor-negative breast cancer in populations with African or European ancestry. The methods used and the loci identified may contribute to better understanding of the genetics of breast cancer.

Hu C, ..., Bertrand KA, ..., Palmer JR, ..., Rosenberg L, et al. A population-based study of genes previously implicated in breast cancer. *N Engl J Med* 2021;384(5):440-51. doi: 10.1056/NEJMoa2005936.

Using data from the Cancer Risk Estimates Related to Susceptibility (CARRIERS) consortium of many breast cancer studies, risks associated with pathogenic variants in known breast cancer-predisposition genes were estimated. Testing for these variants can inform cancer screening and improve clinical strategies.

White AJ, Gregoire AM, Niehoff NM, Bertrand KA, Palmer JR, Coogan PF, Bethea TN. Air pollution and breast cancer risk in the Black Women's Health Study. *Environ Res* 2021;194:110651. doi: 10.1016/j.envres.2020.110651.

Previous research of the relationship between air pollution and breast cancer risk has been predominantly focused on White women. Black women may have higher air pollution exposure due to geographic and residential factors. Using data from the BWHS, we assessed the association between air pollution and breast cancer risk. Overall, there was no association of PM_{2.5}, NO₂, or O₃ with breast cancer risk. However, there were some associations in specific areas of the U.S. that require confirmation.

Isehunwa OO, Warner ET, Spiegelman D, Zhang Y, Palmer JR, Kanaya AM, Cole SA, Tworoger SS, Shields LO, Gu Y, Kent BV, De Vivo I, Shields AE, and the National Consortium on Psychosocial Stress, Spirituality, and Health. Depression, religiosity, and telomere length in the Study on Stress, Spirituality, and Health (SSSH). *Int J Ment Health Addict* 2021;20(3):1465-84. doi: 10.1007/s11469-020-00455-1. PMID: PMC9211376.

Telomeres are nucleotide strands at the ends of chromosomes. Telomere length gets shorter with age. Prospective studies of the association between depression and telomere length, conducted in primarily European ancestry populations, have had mixed results. We examined telomere length in relation to depression in four race/ethnic population cohorts. We found no statistically significant association in the overall cohort or the specific race/ethnic populations, but did see some evidence of a modifying effect of religiosity or spirituality, religious congregation membership, and group prayer. Further research is needed to explore the potential modifying impact of religion and spirituality in diverse populations.

Cozier YC, Barbhaiya M, Castro-Webb N, Costenbader KH, Rosenberg L. A prospective study of reproductive factors in relation to risk of systemic lupus erythematosus among black women. *Lupus* 2021;30(2):204-10. doi: 10.1177/0961203320973074. PMID: PMC7854483.

Systemic lupus erythematosus (SLE) is an autoimmune disease in which the immune system attacks its own tissues, causing inflammation and tissue damage. It occurs most commonly among women of reproductive age. Using data from the BWHS, we assessed the relationships of reproductive factors to SLE risk. Later age at menarche and longer duration of breastfeeding were both associated with increased risk of SLE. These findings require confirmation in other studies of Black women.

Peres LC, Bethea TN, Camacho TF, Bandera EV, Beeghly-Fadiel A, Harris HR, Joslin CE, Moorman PG, Myers E, MD, Ochs-Balcom HM, Setiawan VW, Wu AH, Rosenberg L, Schildkraut JM. Racial differences in population attributable risk for epithelial ovarian cancer in the OCWAA Consortium. *J Natl Cancer Inst* 2021;113(6):710-8. doi: 10.1093/jnci/djaa188.

Causes of racial disparities in the incidence of epithelial ovarian cancer (EOC) are not well-understood, but the prevalence of certain risk factors may explain these disparities. With data from four case-control studies and three case-control studies, including the BWHS, in the Ovarian Cancer in Women of African Ancestry Consortium, we estimated race-specific associations of ten known or suspected EOC risk factors. The selected risk factors accounted for slightly more of the risk among Black women than White women, and interventions focused on modifiable risk factors may be slightly more beneficial to Black women than White women at risk for EOC.

Benefield HC, Zirpoli GR, Allott EH, Shan Y, Hurson AN, Omilian AR, Khoury T, Hong CC, Olshan AF, Bethea TN, Bandera EV, Palmer JR, Ambrosone CB, Troester MA. Epidemiology of basal-like breast cancer among black women in the AMBER consortium. *Cancer Epidemiol Biomarkers Prev* 2021;30(1):71-9. doi: 10.1158/1055-9965.EPI-20-0556.

There are different ways of classifying breast cancers, one of which is the so-called six-marker IHC (ImmunoHistoChemistry) classification. One reason to classify breast cancers is that different types may have different causes, and analyzing risk factors for the different classifications can reveal this. In data from the AMBER consortium, a group of studies that includes the BWHS, breast cancer subtypes had distinct etiologic profiles; that is, different risk factors were associated with different types. In case-control analyses, increased body mass index and waist-to-hip ratio were associated with increased risk of luminal A subtype, while older age at menarche and parity (childbirth) were associated with a reduced risk. For basal-like cancers, parity without breastfeeding and increased waist-to-hip ratio were associated with increased risk, while breastfeeding was associated with reduced risk.

Jordan SJ, ..., Palmer JR, et al. Pregnancy outcomes and risk of endometrial cancer: a pooled analysis of individual participant data in the Epidemiology of Endometrial Cancer Consortium. *Int J Cancer* 2021;148(9):2068-78. doi: 10.1002/ijc.33360.

Full-term pregnancy is associated with reduced risk of endometrial cancer, but it has been unclear whether the effect of additional pregnancies is independent of age at last pregnancy. In data from the Epidemiology of Endometrial Cancer Consortium (E2C2), which includes BWHS data, a full-term pregnancy was associated with greater reduction in risk than an incomplete pregnancy, and each additional pregnancy was associated with further reduction in endometrial cancer risk independent of age at last full-term pregnancy. This suggests the very high progesterone level of the last trimester of pregnancy is not the only explanation for the protective effect.

Zavala VA, ..., Palmer JR, et al. Cancer health disparities in racial/ethnic minorities in the USA. *Br J Cancer* 2021;124(2):315-32. Doi: 10.1038/s41416-020-01038-6.

Several well-established disparities in cancer incidence and outcomes according to race and ethnicity are reviewed. Although substantial progress has been made in understanding underlying factors, inequities persist. More effort needs to be made to increase diversity in cancer research. Structural racism and barriers to healthcare access need to be eliminated in order to eliminate disparities.

2020

Warner ET, Zhang Y, Gu Y, Taporoski TP, Pereira A, DeVivo I, Spence ND, Cozier YC, Palmer JR, Kanaya AM, Kandula NR, Cole SA, Tworoger S, Shields A. Physical and sexual abuse in childhood and adolescence and leukocyte telomere length: a pooled analysis of the study on psychosocial stress, spirituality, and health. *PLoS ONE* 2020;15(10):e0241363. Doi: 10.1371/journal.pone.0241363. PMID: PMC7598522.

Telomeres are lengths of nucleotides that protect the ends of chromosomes. Telomeres shorten with age and experience of trauma has been associated with telomere shortening. Childhood and/or adolescent experiences of abuse in relation to telomere length were assessed in data from five cohort studies, including the BWHS. Sexual abuse in childhood or adolescence, but not physical abuse, was associated with decreased telomere length. There was no evidence of religion or spirituality modifying the association.

Nichols HB, Graff M, Bensen JT, Lunetta KL, O'Brien KM, Troester MA, Williams LA, Young K, Hong CC, Yao S, Haiman CA, Ruiz-Narváez EA, Ambrosone CB, Palmer JR, Olshan AF. Genetic variants in anti-Müllerian hormone-related genes and breast cancer risk: results from the AMBER consortium. *Breast Cancer Res Treat* 2020;185(2):469-78. doi: 10.1007/s10549-020-05944-4. PMID: PMC7867570.

Circulating anti-Müllerian hormone (AMH) levels are positively associated with time to menopause and breast cancer risk. Using data from the AMBER consortium, a group of studies that includes the BWHS, we examined breast cancer associations with single nucleotide polymorphisms (SNPs) in the AMH gene or its receptor genes, among Black

women. There were some associations but none were statistically significant. The results require replication in other studies.

Sheehy S, Palmer JR, Rosenberg L. High consumption of red meat associated with excess mortality among African American women. *J Nutr* 2020;150(12):3249-58. doi: 10.1093/jn/nxaa282. PMCID: PMC7726124.

Red meat is typically high in saturated fats and carcinogens can be formed during cooking and processing. Using data from the Black Women's Health Study's, we assessed the relation of red meat consumption to mortality. Red meat consumption was associated with increased risk of all-cause mortality and cardiovascular mortality, but not with increased cancer mortality.

Bertrand KA, Bethea TN, Gerlovin H, Coogan PF, Barber L, Rosenberg L, Palmer JR. Aspirin use and risk of breast cancer in African American women. *Breast Cancer Res* 2020;22(1):96. doi: 10.1186/s13058-020-01335-1.

Aspirin and other NSAID use has been assessed in relation to breast cancer risk, with mixed results. We investigated the association of use of aspirin with risk of breast cancer in the Black Women's Health Study. For two subtypes of breast cancer that are hypothesized to develop through an inflammatory mechanism, estrogen receptor negative (ER-) and triple negative (TN) breast cancer, current regular use of aspirin was associated with a decreased risk. These results suggest that aspirin may have a potential role in the prevention of ER- and TN breast cancer.

Nguyen LH, Drew DA, Graham MS, Joshi AD, Guo CG, Ma W, Mehta RS, Warner ET, Sikavi DR, Lo CH, Kwon S, Song M, Mucci LA, Stampfer MJ, Willett WC, Eliassen AH, Hart JE, Chavarro JE, Rich-Edwards JW, Davies R, Capdevila J, Lee KA, Lochlainn MN, Varsavsky T, Sudre CH, Cardoso MJ, Wolf J, Spector TD, Ourselin S, Steves CJ, Chan AT, and the Coronavirus Pandemic Epidemiology Consortium. Risk of COVID-19 among front-line health-care workers and the general community: a prospective cohort study. *Lancet Public Health* 2020;5(9):e475-83. doi: 10.1016/S2468-2667(20)30164-X. PMCID: PMC7491202.

Risk of COVID-19 among front-line health-care workers is not well understood. Data from the COVID Symptom Study, which includes participants from the United Kingdom and the United States, was used to assess the risk of contracting COVID-19 among front-line health-care workers as compared to the general public. More than a thousand BWHS participants have contributed information to the COVID Symptom Study. The risk of testing positive for COVID-19 was increased among health-care workers. These findings suggest that the health-care system should ensure availability of PPE and develop additional strategies to increase health workers' protection from infection.

Coogan PF, Schon K, Li S, Cozier YC, Bethea TN, Rosenberg L. Experiences of racism and subjective cognitive function in African American women. *Alzheimers Dement (Amst)* 2020;12(1):e12067. doi: 10.1002/dad2.12067.

Because psychological stress has been associated with memory decline, we assessed whether experiences of racism were associated with lower cognitive function in the BWHS. Participants reported experiences of racism (daily and institutional) in 1997 and 2005 and completed six questions in 2015 about memory, such as problems in remembering a list. The answers to the six questions were used to derive a measure of subjective cognitive function (SCF). Our analyses indicated that women who reported more experiences of racism had lower SCF scores, suggesting that the stress of racism adversely influences cognitive function.

Petrick JL, Castro-Webb N, Gerlovin H, Bethea TN, Li S, Ruiz-Narváez EA, Rosenberg L, Palmer JR. A prospective analysis of intake of red and processed meat in relation to pancreatic cancer among African American women. *Cancer Epidemiol Biomarkers Prev* 2020;29(9):1775-83. Doi: 10.1158/1055-9965.EPI-20-0048. PMID: PMC7484450.

African Americans experience a higher rate of pancreatic cancer than any other U.S. racial or ethnic group, and there is evidence that eating red or processed meat or other foods containing saturated fats may increase the risk of pancreatic cancer. Using data from the Black Women's Health Study, we found that diets higher in unprocessed red meat and saturated fat were associated with increased risk of pancreatic cancer in BWHS participants aged 50 and older, but not among younger women.

Sheehy S, Palmer JR, Rosenberg L. Leisure time physical activity in relation to mortality among African American Women. *Am J Prev Med* 2020;59(5):704-13. doi: 10.1016/j.amepre.2020.05.013. PMID: PMC7577941.

On average, Black women have a life expectancy shorter than that of white women. Physical activity has been found to reduce mortality, but evidence specific to Black women has been limited. We assessed the relation between physical activity and mortality in the Black Women's Health Study. Walking for exercise as well as vigorous exercise were associated with reductions in mortality from all causes, including cardiovascular disease and cancer. Even an hour or two a week of walking appeared effective in reducing risk.

Rosenberg L, Robles YP, Li S, Ruiz-Narvaez EA, Palmer JR. A prospective study of yogurt and other dairy consumption in relation to incidence of type 2 diabetes among black women in the U.S. *Am J Clin Nutr* 2020;112(3):512-8. doi: 10.1093/ajcn/nqaa143.

Yogurt consumption and low-fat dairy consumption have been associated with reduced incidence of type 2 diabetes (T2D) in some studies, but this possibility has received little study in Black populations. We used information provided by BWHS participants in 1995 and 2001 to assess whether intake was related to incidence of T2D. The results indicated that neither yogurt nor other dairy intake was associated with the risk of T2D.

Sponholtz TR, Bethea TN, Ruiz-Narvaez EA, Boynton-Jarrett R, Palmer JR, Rosenberg L, Wise LA. Night shift work and fecundability in late reproductive-aged African American women. *J Womens Health* 2020;30(1):137-44. doi: 10.1089/jwh.2019.8166. PMID: PMC7826436.

Several studies have reported associations between shift work and menstrual cycle irregularity, miscarriage, and low birth weight. Studies examining shift work and female fertility have had inconsistent results. Black women are more likely to work night shifts than White women, but there are no studies of the association between night shift work and time to pregnancy among Black women who are trying to get pregnant. Using data from the BWHS survey, this study found that a history of working night shifts was associated with reduced ability to become pregnant among older reproductive-aged Black women.

Bertrand KA, Castro-Webb N, Cozier YC, Li S, O'Brien KM, Rosenberg L, Palmer JR. Gestational diabetes and risk of breast cancer in African American women. *Cancer Epidemiol Biomarkers Prev* 2020;29(7):1509-11. doi: 10.1158/1055-9965.EPI-20-0034. PMID: PMC7334052.

Gestational diabetes mellitus (GDM) has been hypothesized to increase breast cancer risk, but no studies have examined the association in Black women. Analysis of data from the Black Women's Health Study to evaluate the association of a history of gestational diabetes with breast cancer risk found no evidence of increased risk.

Petrick JL, ..., Rosenberg L, ..., Palmer JR, et al. Exogenous hormone use, reproductive factors and risk of intrahepatic cholangiocarcinoma among women: results from the Liver Cancer Pooling Project and UK Biobank. *Br J Cancer* 2020;123(2):316-24. doi: 10.1038/s41416-020-0835-5. PMID: PMC7374167.

Intrahepatic cholangiocarcinoma (ICC) is the second most common type of liver cancer. The associations between hormone use and reproductive factors and the risk of ICC has not been well studied. Using data from twelve different cohorts, including the BWHS, this study found that hysterectomy and long-term oral contraceptive use may be associated with increased risk of ICC. Further study of this association is needed to confirm the finding.

Cozier YC, Barbhuiya M, Castro-Webb N, Conte C, Tedeschi S, Leatherwood C, Costenbader KH, Rosenberg L. Association of child abuse with systemic lupus erythematosus in Black women during adulthood. *Arthritis Care Res* 2020;73(6):833-40. doi: 10.1002/acr.24188. PMID: PMC7487019.

Experiences of psychosocial stress may negatively impact the stress response, which may be involved in the development of systemic lupus erythematosus (SLE). We assessed the relationship between childhood sexual and physical abuse and the risk of SLE in the BWHS. Women who reported higher levels of sexual and physical abuse in childhood had an increased risk of SLE in adulthood. More research is needed to confirm this finding and to understand the possible mechanisms leading to increased occurrence of SLE.

Dash C, Yu J, Nomura S, Rosenberg L, Palmer JR, Adams-Campbell LL. Obesity is an initiator of colon adenomas but not a promoter of colorectal cancer in the Black Women's Health Study. *Cancer Causes Control* 2020;31(4):291-302. doi: 10.1007/s10552-020-01283-3.

In an examination of anthropometric factors (body mass index, waist circumference, waist-to-hip ratio) in relation to risk of colorectal adenoma (noncancerous growths in the colon) and colorectal cancer in the BWHS, we found no association of these factors with risk of colorectal cancer. Among women 50 and older higher body mass index, waist circumference, and waist-to-hip ratio were associated with an increase in risk of adenomas. Other studies have found high body mass index and other measures of body mass to be associated with colon cancer in men, but an association in women seems to be weaker or absent.

Palmer JR, ..., Bertrand KA, et al. Contribution of germline predisposition gene mutations to breast cancer risk in African American women. *J Natl Cancer Inst* 2020;112(12):1213-21. doi: 10.1093/jnci/djaa040. PMID: PMC7735769.

Using data from ten different epidemiological studies, including the BWHS, this study identified genes associated with a higher risk of breast cancer in Black women. Being able to identify these genes demonstrates the validity of specific genetic testing panels for the use in Black women as well as supporting the idea of increased referral of Black women for cancer genetic testing.

Schoemaker MJ, ..., Bertrand KA, ..., Palmer JR, et al. Adult weight change and premenopausal breast cancer risk: a prospective pooled analysis of data from 628,463 women. *Int J Cancer* 2020;147(5):1306-14. doi: 10.1002/ijc.32892.

There is a strong inverse association between early-adulthood weight and risk of premenopausal breast cancer, but it is unclear whether subsequent changes in weight affect this risk. Data from 17 prospective studies including the BWHS was used to investigate the association of weight change with premenopausal breast cancer risk, taking into consideration initial weight in early adulthood, timing of weight change, and other breast cancer risk factors and breast cancer subtype. Weight loss was not consistently associated with overall breast cancer risk or subtype risks after taking into account initial weight. Weight increase from early adulthood (ages 18-24 years) until age 54 was associated with reduced premenopausal breast cancer risk independent of early adulthood weight.

Petrick JL, ..., Rosenberg L, ..., Palmer JR, et al. Associations between prediagnostic concentrations of circulating sex steroid hormones and primary liver cancer among postmenopausal women. *Hepatology* 2020;72(2):535-47. doi: 10.1002/hep.31057.

Incidence rates of liver cancer (LC) are 100-200% higher in males than in females, the difference predominantly driven by hepatocellular carcinoma (HCC), which accounts for 75% of LC cases. Intrahepatic cholangiocarcinoma (ICC) accounts for 12% of cases and has rates only 30% higher in males. It is hypothesized that hormones account for this

disparity. Using data from five prospective cohorts, we investigated whether prediagnostic circulating hormone and sex hormone binding globulin (SHBG) levels were associated with LC risk. Our findings suggest that higher levels of 4-androstenedione (4-dione) may be associated with lower risk, that SHBG may be associated with higher risk of LC, and that estradiol may be associated with an increased risk of ICC.

Cozier YC, Heaton B, Bethea TN, Freudenheim JL, Garcia RI, Rosenberg L. Predictors of self-reported oral health in the Black Women's Health Study. *J Public Health Dent* 2020;80(1):70-78. doi: 10.1111/jphd.12351. PMID: PMC7227786.

Poor oral health is associated with many negative health outcomes and it is well documented that Black Americans in the US have poorer oral health than their White counterparts. However, gender differences in oral health are less well understood, particularly for Black women, who also have higher rates of many chronic diseases. The BWHS collected and analyzed self-reported oral health information. Analysis shows that poorer oral health among Black women is associated with smoking, diabetes, hypertension, lower education levels, obesity, and higher parity. These findings are consistent with what has been observed in other populations.

Florio AA, ..., Rosenberg L, ..., Palmer JR, ..., Petrick JL. Abdominal and gluteofemoral size and risk of liver cancer: the Liver Cancer Pooling Project. *Int J Cancer* 2020;147(3):675-85. doi: 10.1002/ijc.32760. PMID: PMC7391795.

Obesity is a known risk factor for primary liver cancer, but it has been unclear whether waist or hip size affects risk. Using data from twelve studies in the Liver Cancer Pooling Project, the association of waist and hip measurements with risk of primary liver cancer was examined. Findings suggest that excess weight around the waistline is associated with increased risk of liver cancer, even among individuals with a normal body mass index (BMI), but that excess weight around the hips does not increase risk.

Bethea TN, Zhou ES, Schernhammer ES, Castro-Webb N, Cozier YC, Rosenberg L. Perceived racial discrimination and risk of insomnia among middle-aged and elderly Black women. *Sleep* 2020;43(1):zsz208. doi: 10.1093/sleep/zsz208. PMID: PMC6955644.

Insomnia, chronic difficulty falling or staying asleep, is associated with risk of physical and mental health disorders. Many studies have found that Black Americans are at higher risk for developing sleep problems. Some studies have found that chronic stress due to experience of racism is associated with sleep problems. Within the BWHS, data on everyday and lifetime racism and insomnia symptoms were collected, and higher levels of perceived racism were associated with an increased risk of insomnia among middle-aged and elderly Black women.

Bertrand KA, Bethea TN, Rosenberg L, Bandera EV, Khoury T, Troester MA, Ambrosone CB, Palmer JR. Risk factors for estrogen receptor positive ductal carcinoma in situ of the breast in African American women. *Breast J* 2019;49:108-14. doi: 10.1016/j.breast.2019.10.009.

With data from the African American Breast Cancer Epidemiology and Risk Consortium, which includes the BWHS, we examined risk factors for estrogen receptor positive (ER+) ductal carcinoma in situ (DCIS). In this condition, there are abnormal cells in the milk duct of the breast that might proceed to cancer. Results suggested that most risk factors associated with increased risk of ER+ DCIS are the same as those associated with invasive ER+ breast cancer.

Schildkraut JM, Peres LC, Bethea TN, Camacho F, Chyn D, Cloyd EK, Bandera EV, Beeghly-Fadiel A, Lipworth L, Joslin CE, Davis FG, Moorman PG, Myers E, Ochs-Balcom HM, Setiawan VW, Pike MC, Wu AH, Rosenberg L. Ovarian Cancer in Women of African Ancestry (OCWAA) consortium: a resource of harmonized data from eight epidemiologic studies of African-American and white women. *Cancer Causes Control* 2019;30(9):967-78. doi: 10.1007/s10552-019-01199-7.

The death rate from epithelial ovarian cancer (EOC) is higher in Black women than White women. The BWHS has joined with seven other studies of ovarian cancer in a consortium called OCWAA (Ovarian Cancer in Women of African Ancestry). The study will overcome the problem of small sample sizes in individual studies to better understand racial differences in EOC risk and survival. The combined effort will provide a large enough sample size to produce meaningful research in this area.

Lu D, Palmer JR, Rosenberg L, Shields AE, Orr EH, DeVivo I, Cozier YC. Perceived racism in relation to telomere length among African-American women in the Black Women's Health Study. *Ann Epidemiol* 2019;36:33-9. doi: 10.1016/j.annepidem.2019.06.003.

Telomeres (protein structures at the ends of chromosomes) become shorter as a person becomes older. Telomeres that are shorter than expected for a given age have been found to be associated with premature morbidity and mortality (earlier ages of death and illness). In the BWHS, an analysis of telomere length and self-reported experience of everyday racism found shorter telomere length among women who reported not discussing those experiences of racism with others. Further work is need to confirm this association.

Coogan PF, Bethea TN, Cozier YC, Bertrand KA, Palmer JR, Rosenberg L, Lenzy Y. Association of type 2 diabetes with central-scalp hair loss in a large cohort study of African American women. *Int J Womens Dermatol* 2019;5:261–6. doi: 10.1016/j.ijwd.2019.05.010.

Hair loss on the central scalp affects African American women much more commonly than women in other ethnic/racial groups. The causes are obscure, although one hypothesis suggests that type 2 diabetes may increase the risk. We examined this hypothesis in the BWHS, in the largest study yet conducted of type 2 diabetes in relation to central hair loss. BWHS participants with type 2 diabetes were found to be at increased

risk for severe central scalp hair loss. By monitoring diabetes patients for signs of hair loss, health care providers could offer appropriate referral for early treatment.

Gerlovin H, Michaud DS, Cozier YC, Palmer JR. Oral health in relation to pancreatic cancer risk in African American women. *Cancer Epidemiol Biomarkers Prev* 2019;28(4):675-9. doi: 10.1158/1055-9965.EPI-18-1053.

The incidence of pancreatic cancer is higher in African Americans than in U.S. whites. Poor oral health, which is more common among African Americans, has been associated with increased risk of pancreatic cancer in several studies of white populations. We found that tooth loss and periodontal disease were associated with increased risk of pancreatic cancer, especially among nonsmokers in the BWHS. Future research is needed to examine the association between micro-organisms that reside in the mouth and the risk of pancreatic cancer.

Chetwynd EM, Stuebe AM, Rosenberg L, Troester MA, Palmer JR. Prepregnancy diabetes and breastfeeding cessation among Black women in the United States. *Breastfeed Med* 2019;14(4):249-55. doi: 10.1089/bfm.2018.0074.

Breastfeeding is recognized as good for babies and good for mothers (for example, it has been found to lower risk of ER- breast cancer in women who have breastfed). In the U.S., Black women are disproportionately affected by diabetes, and they are less likely to breast feed their babies than White women. This study examined the relationship between diabetes before pregnancy and the duration of breastfeeding among women in the BWHS. The results suggest that the duration of breastfeeding among women with pre-pregnancy diabetes is shorter than that among women without pre-pregnancy diabetes. Lactation support for women who wish to breastfeed their babies could help them continue breastfeeding for longer.

Webb PM, Na R,..., Bertrand KA,..., Palmer JR, et al. Use of aspirin, other nonsteroidal anti-inflammatory drugs and acetaminophen and risk of endometrial cancer: the Epidemiology of Endometrial Cancer Consortium. *Ann Oncol* 2019;30(2):310-6. doi: 10.1093/annonc/mdy541.

Regular use of aspirin has been associated with a reduced risk of several cancers, but the data for endometrial cancer are conflicting. Evidence regarding use of other analgesics is limited. In this pooled analysis of 12 studies (including BWHS), participating in the Epidemiology of Endometrial Cancer Consortium, weekly use of aspirin was associated with a 15% decrease in risk of endometrial cancer among overweight and obese women, but not among thinner women. There was no clear association of acetaminophen use with endometrial cancer.

Barber LE, Bertrand KA, Rosenberg L, Battaglia TA, Palmer JR. Pre- and perinatal factors and incidence of breast cancer in the Black Women's Health Study. *Cancer Causes Control* 2019;30(1):87-95. doi: 10.1007/s10552-018-1103-3.

In this study of BWHS participants, factors at or around the time of birth (birthweight, preterm birth, singleton or multiple birth, mother's age, birth order, breastfed or bottlefed) were examined in relation to breast cancer risk. The factors most strongly associated with higher risk of breast cancer were high birthweight (>8lbs 13oz) and mother aged 35 or more years at the birth. Trends towards delayed childbirth and higher birthweights, coupled with the high rates of low birth weight among African Americans, may contribute to increases in breast cancer incidence.

Cozier YC, Barbaiya M, Castro-Webb N, Conte C, Tedeschi S, Leatherwood C, Costenbader KH, Rosenberg L. A prospective study of obesity and risk of systemic lupus erythematosus (SLE) among black women. *Semin Arthritis Rheum* 2019;48(6):1030-4. doi: 10.1016/j.semarthrit.2018.10.004.

The relation of overweight to lupus (systemic lupus erythematosus, SLE) has been examined in studies of White women. In our examination of obesity in relation to SLE risk in the BWHS, we found no association of overweight or obesity adulthood with risk of SLE. However, obesity as a teenager was associated with increased risk of SLE. It has been suggested that a possible biologic mechanism involves systemic inflammation related to overweight but further studies are needed to understand and establish the mechanisms.

Nichols HB, ..., Bertrand KA, ..., Palmer JR, et al. Breast cancer risk after recent childbirth: a pooled analysis of 15 prospective studies. *Ann Intern Med* 2019;170(1):22-30. doi: 10.7326/M18-1323.

Childbirth is thought to be protective against some forms of breast cancer, especially ER+ breast cancer, in the long-term, but it may raise risk in the shorter term. The BWHS participated in a large study that combined data of 15 prospective cohort studies to examine how childbirth affects the long-term risk of breast cancer. Compared to women who had not given birth, the risk of breast cancer was higher for 24 years among women who had given birth, and risk was greatest 5 years after childbirth. After 24 years, the risk of ER+ breast cancer was lower among women who had given birth than among women who had not given birth. Thus, consideration of a woman's risk of breast cancer should include how long ago she gave birth.

Cozier YC, Barbaiya M, Castro-Webb N, Conte C, Tedeschi SK, Leatherwood C, Costenbader KH, Rosenberg L. Relationship of cigarette smoking and alcohol consumption to incidence of systemic lupus erythematosus in the Black Women's Health Study. *Arthritis Care Res* 2019;71(5):671-7. doi: 10.1002/acr.23703.

This study examined smoking and alcohol consumption in relation to the risk of lupus (systemic lupus erythematosus, SLE) in the BWHS. The results, showing increased risk of SLE associated with cigarette smoking and decreased risk of SLE associated with moderate alcohol consumption, are consistent with findings in studies of White women.

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.

Ochs-Balcom HM, Shaw H, Preus L, Palmer JR, Haddad SA, Rosenberg L, Ruiz-Narváez EA. Admixture mapping and fine-mapping of birth weight loci in the Black Women's Health Study. *Hum Genet* 2018;137(6-7):535-42. doi: 10.1007/s00439-018-1908-x.

Studies of European ancestry populations have identified genetic variants associated with birthweight. However, the prevalence of low birth weight is greater among African Americans and studies of genetic variants associated with low birthweight in this population are needed. The present study identified genetic markers associated with birthweight in the BWHS. High African ancestry was associated with low birth weight as were multiple novel independent birth-weight associated genetic variants. This study suggests that birth weight-associated genetic variants contribute to race-associated birth weight disparities.

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.

Nomura SJO, Dash C, Rosenberg L, Palmer JR, Adams-Campbell LL. Fruit and vegetable intake and lung cancer incidence among Black women according to cigarette smoking status. *Nutr Cancer* 2018;70(6):904-12. doi: 10.1080/01635581.2018.1491608.

This study examined the associations of fruit and vegetable intake and cigarette smoking with risk of lung cancer in the BWHS. Smoking was associated with a large increase in lung cancer incidence. Fruit and vegetable consumption was not associated with risk of lung cancer regardless of smoking history.

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.

Hellwege JN, ..., Ruiz-Narváez EA, ..., Palmer JR, Rosenberg L, et. A multi-stage genome-wide association study of uterine fibroids in African Americans. *Hum Genet* 2017;136(10):1363-73. doi: 10.1007/s00439-017-1836-1.

Race is a strong risk factor for uterine fibroids, a condition that affects the majority of women by the time they reach menopause and disproportionately affects African American women. The Black Women's Health Study participated in an analysis that assessed genetic risk factors for fibroids. We identified a new risk locus within the gene *CYTH4* that impacts gene expression in the thyroid that had a statistically significant association with fibroid risk among African American women.

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 suggests 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 NO₂ 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 (NO₂) 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 NO₂ 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 to 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 association 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 NO₂ 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 (NO₂) 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 NO₂.

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_{2.5} 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_{2.5}) has been linked to increases in insulin resistance and blood pressure, raising the possibility that PM_{2.5} 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_{2.5} levels and then assessed whether levels were related to the occurrence of type 2 diabetes or hypertension. Our analysis suggested that PM_{2.5} 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):djv172. doi: 10.1093/jnci/djv172.

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 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 37th week of

pregnancy) were 20% more likely to report developing type 2 diabetes, and those who had a very premature birth (before_ the 32nd 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.

2013

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.

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.

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.

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 ≥ 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 (≥ 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.

