

Silent Spring Institute Guide to Cohort Studies for Environmental Breast Cancer Research

Studies of environmental pollutants – including mammary gland carcinogens or endocrine disruptors (chemicals that mimic or block hormones) – have great potential to inform breast cancer prevention. Studying pollutants and breast cancer is especially challenging, though:

- Breast cancer is influenced by factors across the life cycle from before birth to the five years before a diagnosis, so cross-sectional research can miss important effects. (Cross-sectional studies measure disease status and exposure at the same time.)
- Because breast cancer is influenced by multiple factors with no “smoking gun,” we sometimes need large studies to discern effects.
- Measuring the range of exposures to the many pollutants we are all exposed to poses challenges and adds cost.

Adding environmental pollutants to existing cohort studies can be an effective and efficient way to learn more. A cohort study is an epidemiological study that follows participants over many years, repeatedly assessing their exposure and health status.

To help researchers find ongoing studies that offer the best foundation for new environmental research, Silent Spring Institute developed a tool that identifies ongoing women’s health cohort studies and provides researchers with key information about them. We included cohort studies in which women’s health status was assessed over time and environmental and other exposure information was either collected or could be derived. This addition to Silent Spring Institute’s resources for researchers complements the Mammary Carcinogens Review Database, which identifies chemicals that are priorities for further study; Epidemiology Reviews Database; and review articles in *Cancer* and *Environmental Health Perspectives*. A version of this table was published as Supplemental Material Tables 2 and 3 in our 2014 *EHP* review of biomarkers for mammary carcinogens.

What we did:

Studies were identified by searching the websites of major epidemiological study funders such as the National Institutes of Health (e.g. [RePORTER database](#), [Cohort Consortium](#) website) and medical literature databases, and communicating with researchers studying women’s health.

For each study, the Principal Investigators (PIs), funding agency, study population, study period, current exposure measurements, and health outcomes were noted. For studies in progress, prospective outcomes were identified. Accuracy of entries was verified with the PI.

How to use this resource:

The study names in the table are hyperlinked and can be used to obtain additional information about the study and the potential for collaboration. A guide to abbreviations is included at the end of the document.

Help us update this resource:

This resource was last updated in May 2014. We will periodically update information and add new studies. If you have new information about a study listed or a new study that could be added, please contact us at info@silentspring.org or 617-332-4288.

Silent Spring Institute is a nonprofit research organization dedicated to studying the links between the environment and women’s health. Development of the *Guide to Cohort Studies for Environmental Breast Cancer Research* was funded by the **Avon Foundation for Women**.

Cohort Studies Related to Women's Health and the Environment

Institution (PI)	Funder(s)	Study Population	Study Period	Measurements	Health Outcomes
Agricultural Health Study					
NCI (Michael Alvanaja and Laura Beane Freeman), NIEHS (Dale Sandler and Jane Hoppin), US EPA (Kent Thomas), NIOSH (Cynthia Hines)	NCI, NIEHS, NIOSH, US EPA	89,000 private pesticide applicators (farmers) and their spouses in Iowa and North Carolina, as well as commercial pesticide applicators in Iowa.	Ongoing research: 1993-present	Measurements include surveys of smoking, drinking and diet; buccal rinse samples; information on occupational practices; lifestyle factors; pesticide exposure; family history of cancer; reproductive history; agricultural exposure; and general health.	Outcomes include cancer (breast, leukemia, myeloma, non-Hodgkin's lymphoma, melanoma of the skin, lung, colon, rectal, pancreas, bladder, and prostate), asthma, neurologic disease, injury, mortality, and adverse reproductive effects.
Arteriosclerosis Risk in Communities (ARIC)					
Johns Hopkins (Elizabeth A. Platz), University of North Carolina (David Couper)	NIH	15,792 participants (55% female, 27% African-American) aged 45-64 in 1987 recruited from North Carolina, Mississippi, Minneapolis, and Maryland; 3,145 participants diagnosed with cancer by 2006.	Ongoing research: 1987-present	Measurements include blood and urine samples, clinical exams, food frequency questionnaires; tissue blocks to be collected from cancer cases.	This cohort was originally established to study arteriosclerosis, but has data on cancer incidence and recently received funding to collect and analyze more detailed information about cancer diagnoses and treatments.
Avon Longitudinal Study of Parents and Children (ALSPAC; Children of the 90s)					
University of Bristol (George Davey Smith)	UK Medical Research Council, Wellcome Trust, University of Bristol	13,761 pregnant women near Avon, England recruited in 1991-92, along with their children and partners.	Ongoing research: 1991-present	Measurements include blood, urine, hair, nail, saliva, placenta samples; lymphoblastoid cell lines; DNA; questionnaire and clinical data.	Outcomes include development and puberty outcomes in children and breast and other cancer in mothers.
Black Women's Health Study					
Slone Epidemiology Center at Boston University (Lynn Rosenberg and Julie Palmer), Lombardi Cancer Center at Georgetown University (Lucile Adams-Campbell)	NIH	59,000 black women in US.	Ongoing research: 1995-present (funded through 2014)	Measurements include questionnaires every two years, medical records (if disease of interest), cancer registry data. Validation studies: dietary study (400), physical activity study (100+), and buccal cell samples (26,800).	Outcomes include breast and other cancers, and nonmalignant conditions that disproportionately affect black women.
Breakthrough Generations Study					
University of London Institute of Cancer Research (Anthony Swerdlow and Alan Ashworth)	University of London Institute of Cancer Research, Breakthrough Breast Cancer	112,049 British women, ages 16-102 at recruitment; 30% are first-degree relatives of another study member.	Ongoing research: recruitment 2003-2011, follow-up expected to continue at least through 2050	Measurements include questionnaires about current exposures, historical exposures, and anthropomorphic measurements every 2 1/2 years, blood samples at enrollment (follow-up blood samples planned).	Outcomes include breast and other cancer incidence and mortality, as well as details including histology, grade information, and hormone receptor information. Information on other illnesses and cause of death also collected.
Breast Cancer Family Registry					
National Cancer Institute (Sheri Dixon Schully), Columbia University (Mary Beth Terry), Northern California Cancer Center (Esther John), Fox Chase Cancer Center (Mary Daly), University of Utah (Saundra Buys), University of Melbourne (John Hopper), Cancer Care Ontario (Irene Andrusis)	NCI	40,000 participants from more than 13,000 families, enrolled from population-based case families, population-based control families, and clinic-based families.	Ongoing research: 1996-present	Measurements include family history information, epidemiological and clinical data, and biological specimens (blood and/or buccal samples and tumor tissue).	Outcomes include breast cancer.
California Flight Attendants Study					
Northern California Cancer Center (Peggy Reynolds)	California Breast Cancer Research Program	Residents of CA and members of the Association of Flight Attendants (AFA).	1988-1995	Measurements include work history information and matching of AFA members with the California Cancer Registry.	Outcomes include breast and other cancers.

Cohort Studies Related to Women's Health and the Environment

Institution (PI)	Funder(s)	Study Population	Study Period	Measurements	Health Outcomes
California Teachers Study					
City of Hope Comprehensive Cancer Center (Leslie Bernstein), California Department of Health Services, Northern California Cancer Center, UC Irvine, and USC	NIH, NCI, others	133,479 current and former public school teachers or administrators who participate in the California State Teachers Retirement System (STRS); ages range from 22 to 104 (mode 50-60). >12,000 cancer diagnoses (4,576 invasive breast cancer diagnoses, 1,091 in situ breast cancer diagnoses).	Ongoing research: 1995-present (funded through 2016)	Measurements include questionnaires, cancer registry data, mortality data, blood samples for 1,800 breast cancer cases and 2,600 controls, 3,000 buccal cell samples, 400 toenail samples, and a measurement substudy of 328 (304 with urine samples).	Outcomes include breast and other cancers, and general health.
Canadian National Breast Screening Study (CNBSS)					
University of Toronto (Anthony Miller), Albert Einstein College of Medicine (Tom Rohan)	Canadian Breast Cancer Foundation	89,835 women living in 12 Canadian cities who were between 40-59 years at enrollment (1982-1987). 50,430 women age 40-49 and 39,405 age 50-59. 56,837 completed a self administered dietary questionnaire.	1980-1987 (recruitment); continued passive follow-up using national databases	Measurements include breast physical exam, mammography, pathology results, questionnaire data, food frequency questionnaire, demographic information, breast and other cancer incidence and cohort mortality.	Outcomes include breast, lung, and other cancers.
Canadian Partnership for Tomorrow					
Various	Canadian Partnership Against Cancer, regional institutions	Over 250,000 Canadians in five regions of Canada.	Ongoing research: 2001-present	Measurements include blood, saliva, varied questionnaire and clinical data depending on sub study.	Outcomes include breast and other cancers.
Cancer Prevention Study 3 (CPS 3)					
American Cancer Society (Alpa Patel)	American Cancer Society	Expected size of 500,000 men and women age 30-65 with no personal history of cancer; goal of at least 25% minority participation.	New research (enrollment ongoing, 20+ years follow-up planned)	Measurements include baseline survey, waist measurement and blood sample. Questionnaire data will be collected every 2-3 years. Participants reporting cancer will be verified through medical records or cancer registry linkage.	Outcomes include all causes of mortality and cancer incidence.
Cancer Prevention Study II (CPS II)					
American Cancer Society (Susan Gapstur)	American Cancer Society	1.2 million American men and women enrolled in 1982.	Ongoing research: 1982-present	Measurements include the 1982 baseline questionnaire; additional questionnaires in 1992, 1997, and every two years thereafter (CPS-II Nutrition Cohort); blood samples (39,380) and buccal cells (from an additional 67,000).	Outcomes include mortality from breast and other cancers (1982-present). Incidence of breast cancer and other cancers since 1992 for CPS-II Nutrition Cohort (~98,000 women, ~84,000 men).
Child Health and Development Study (CHDS)					
Public Health Institute (Barbara Cohn)	NIH	Women living near Oakland, CA who were under the care of Kaiser Permanente Health Plan were enrolled when they first found out they were pregnant. 15,528 families, 20,530 pregnancies, 20,754 babies and 19,044 live births enrolled from 1959 to 1967.	Ongoing research: 1959-present	Measurements include prenatal maternal interviews, clinical assessments, biological specimens, placental pathologies, medical histories (physical and mental), developmental, emotional and behavioral assessments, and reproductive outcomes.	Outcomes include pregnancy and infant health and development, early experiences and disease/condition onset, and cancer and mortality in fathers, mothers and now-adult children.

Cohort Studies Related to Women's Health and the Environment

Institution (PI)	Funder(s)	Study Population	Study Period	Measurements	Health Outcomes
CLUE I & II					
Bloomberg School of Public Health, John Hopkins University (Kala Visvanathan)	Johns Hopkins University Bloomberg School of Public Health and NCI Intramural Program	25,802 participants in 1974, 32,898 participants in 1989 (overlap of 8395); over half female. Both samples have "reasonable representation of the general county population."	1974 to 2007 (some information from 1963 and 1965)	Measurements include blood sample, blood pressure and questionnaires.	Outcomes include breast and other cancers, CVD, and stroke.
Columbia, Missouri Serum Bank					
NCI (Louise Brinton)	NCI	7,224 women living in and around Columbia, MO.	Enrollment in 1977-1987	Measurements include hormones measured in serum collected from 1977-1987 and follow-up questionnaires.	Outcomes of interest include breast cancer.
DES Combined Cohort Follow-up Study					
Various researchers	NCI, CDC	Multiple cohort studies combined; NCI still follows approximately 15,000 members of the combined cohort study.	Ongoing research: 1971-present (individual cohorts); 1991-present (combined cohorts)	Measurements include questionnaires about reproductive health.	Outcomes include breast and other cancers and reproductive effects.
European Prospective Investigation into Cancer and Nutrition (EPIC)					
IARC, WHO (Elio Riboli)	European Commission "Europe Against Cancer" Programme	520,000 men and women in 10 European countries (Denmark, France, Germany, Greece, Italy, The Netherlands, Norway, Spain, Sweden and UK); participants mostly age 20 or older at enrollment (1993-1999).	Ongoing research: 1992-present	Measurements include a baseline survey; anthropometric assessment (e.g. height, weight, hip and waist measurements); and blood samples.	Outcomes include chronic diseases, including breast and other cancers.
Framingham Heart Study					
NHLBI (Daniel Levy and Christopher O'Donnell) and Boston University (Philip Wolf, William Kannel, Emelia Benjamin, Joanne Murabito, and Ralph D'Agostino)	NHLBI	Original cohort: 5,209 men and women from Framingham, MA ages 30 to 62 in 1948. Offspring cohort: 5,124 adult children of original cohort and their spouses, enrolled in 1971. Generation III cohort: 4,095 adult grandchildren. Omni Cohort 1: 506 minority men and women enrolled in 1994 to increase ethnic diversity of participants. Omni Cohort 2: 402 participants added to the original omni cohort.	Ongoing research: 1948-present	Measurements include medical histories (including hormone use), physical exams, and laboratory tests (plasma) every 2 years.	Outcomes include CVD and other chronic outcomes, including breast cancer.
General COhort of Adults in NORway (CONOR)					
Norwegian University of Science and Technology (Lars J. Vatten), The Norwegian Cancer Registry (Giske Ursin)	Norwegian Institute of Public Health, University of Tromsø, Norwegian University of Science and Technology in Trondheim, University of Bergen, and University of Oslo	185,000 participants in different parts of Norway.	Ongoing research: 1993 to present	Measurements include blood samples, extracted DNA, cancer data and smoking, body mass and physical activity data.	CONOR is a collaboration studying rare diseases and cancer; member studies may include other outcomes.

Cohort Studies Related to Women's Health and the Environment

Institution (PI)	Funder(s)	Study Population	Study Period	Measurements	Health Outcomes
Great Lakes Human Health Effects Research Program (GLHHERP)					
ATSDR (Heraline Hicks), multiple funded organizations	ATSDR	People residing in the Great Lakes basin (multiple cohorts, multiple studies).	Ongoing research: 1992-present	Measurements include surveys, gene function and biomarkers measured in blood, and morbidity/mortality data (depends on specific research project).	Outcomes include health effects related to fish consumption (depends on specific research project).
Health, Eating, Activity, and Lifestyle Study (HEAL)					
NCI (Rachel Ballard-Barbash), Fred Hutchinson Cancer Research Center (Anne McTiernan), City of Hope National Medical Center (Leslie Bernstein), New Mexico Tumor Registry (Charles Wiggins)	NCI	~1200 women with early-stage breast cancer recruited from Seattle area, New Mexico, and Southern California.	Ongoing research: 1996-present	Measurements include anthropometric measurements, hormone measurements, vitamin D, and genetic information (blood), mammographic density, and questionnaire including diet, physical activity, quality of life.	Outcomes include breast cancer recurrence and survival.
Hormones and Diet in the Etiology of Breast Cancer Risk (ORDET)					
Istituto Nazionale Per lo Studio e la Cura dei Tumori (Franco Berrino, Paola Muti, Vittorio Krogh)	NCI, US Army Medical Research and Material Command	10,786 Italian women without any history of cancer or hormone therapy, age 35-69 at enrollment; about 130 breast cancer cases with blood samples.	1987-2003 (enrollment 1987-1992)	Measurements include questionnaires, anthropometric variables, blood samples, and urine samples.	Outcomes include incident breast cancer.
Iowa Women's Health Study					
University of Minnesota (Kim Robien)	NCI	41,836 Iowa women, age 55-69 in 1986; >2,900 incident breast cancers by 2007.	Ongoing research: 1985-present	Measurements include surveys (one at baseline and 5 follow-ups), DNA (limited number of participants), and water samples.	Outcomes include CVD, chronic disease, and cancer, including breast cancer.
Janus Serum Bank					
Cancer Registry of Norway, Institute of Population-based Cancer Research (Hilde Langseth)	Cancer Registry of Norway	317,000 Norwegians comprising blood donors in Oslo area and participants in past studies; 52,500 donors diagnosed with cancer by 2009.	Ongoing research: Specimens collected 1972-2004, with ongoing collection from earlier donors who have developed cancer since donating.	Measurements include blood samples.	Outcomes include cancers, recorded in Norwegian Cancer Registry.
Japan Public Health Center-Based Prospective Study (JPHC)					
Research Center for Cancer Prevention and Screening, National Cancer Center (Shoichiro Tsugane)	Grant-in-Aid for Cancer Research from the Ministry of Health, Labor and Welfare, Japan	140,420 residents of 29 municipalities within 11 public health center (PHC) areas nationwide.	Ongoing research: 1990-present	Measurements include three surveys of lifestyle habits to date, at five-year intervals, blood samples and health check-up data from 60,000 people.	Outcomes include mortality, incidence of cancer, cerebrovascular disease and ischemic heart disease, diabetes mellitus, periodontal disease, age-related cataract, vertebral fracture, and other chronic diseases.
Kaiser Research Program on Genes, the Environment and Health (RPGEH)					
Kaiser Permanente (Cathy Schaefer)	Community Benefit Program of Kaiser Permanente, Robert Wood Johnson Foundation, Wayne and Gladys Valley Foundation, Ellison Medical Foundation	500,000 Northern California Kaiser Permanente members (men and women). Current enrollment is 200,000.	Ongoing research: 2007-present	Measurements include medical, lifestyle, demographic, environmental and, in some cases, genetic information from saliva and blood samples.	Outcomes include CVD, cancer, diabetes, high blood pressure, Alzheimer's disease, asthma and many others.

Cohort Studies Related to Women's Health and the Environment

Institution (PI)	Funder(s)	Study Population	Study Period	Measurements	Health Outcomes
Kathleen Cuningham Foundation Consortium for Research into Familial Aspects of Breast Cancer (kConFab) biospecimen and data resource					
Various	Australian National Health and Medical Research Council, State Cancer Councils, National Breast Cancer Foundation	Members of 1,600 families with multiple breast cancer cases.	Ongoing research: 1997-present	Measurements include genetic, epidemiological, medical, psychosocial and clinical follow-up data, biospecimens.	Outcomes include familial breast, ovarian, prostate and pancreatic cancer.
Life After Cancer Epidemiology (LACE)					
Kaiser Foundation Research Institute (Bette Caan)	NCI	2,321 early stage breast cancer survivors (diagnosed 1997-2000) in Northern California or Utah, age 18-70, who had completed treatment other than adjuvant hormonal therapy and were free of recurrence.	2000-2004	Baseline data collected approximately two years post diagnosis and 5-6 years post diagnosis including annual questionnaires on demographics, medical history, anthropometry, diet, supplements, physical activity and quality of life.	Outcomes include breast cancer recurrence and mortality and overall mortality.
Love/Avon Army of Women					
Dr. Susan Love Research Foundation	Avon Foundation	1 million women (~373,000 as of July 2013).	Ongoing research: 2008-present	Measurements vary depending on research project.	Outcomes vary depending on research project.
Massachusetts Women's Health Study					
New England Research Institutes (Sonja McKinlay)	NIH/NIA	8,000+ MA women born between 1926 and 1936 (age 45-54); follow up of all 2,572 premenopausal women.	1982-1987 and 1986-1996 for a sub-cohort with physiological measures	Measurements include cross-sectional survey (8,000+), telephone interviews every 9 months for 54 months (2,572) and then annually (~450).	Outcomes include timing of menopause and potentially menopause-related experiences.
Mayo Mammography Health Study					
Mayo Clinic College of Medicine (Celine M. Vachon)	Mayo Clinic Cancer Center	19,924 women ages 35 and over, living in Minnesota, Iowa, and Wisconsin, without a history of breast cancer.	Ongoing research: 2003-present	Measurements include mammograms, self-administered questionnaire, and blood samples from over half of participants.	Outcomes include breast and other cancers.
Melbourne Collaborative Cohort Study (MCCS, a.k.a. Health 2020)					
Cancer Council Victoria (Graham Giles)	Cancer Council Victoria	41,500 people (24,500 women and 17,000 men) age 40-69; southern European migrants (25% of participants) were deliberately over-sampled to increase the range of lifestyle exposures and genetic variation.	Ongoing research: 1990-present	Measurements include baseline interview, physical measurements, food frequency questionnaire and blood sample; follow-up questionnaire administered 3-4 years after baseline; second physical follow-up administered 12-14 years after baseline.	Outcomes include cancer and all-cause mortality.
MESA (Multi-Ethnic Study of Atherosclerosis; including MESA Family, MESA Air, and MESA Lung)					
University of Washington - Coordinating Center (Richard Kronmal), Columbia, Johns Hopkins, Wake Forest, Northwestern, UCLA, University of Minnesota	NHLBI	6,814 multi-ethnic (White, Black, Hispanic, Chinese) men and women ages 45-84 from six field centers across the US.	2000-2009	Measurements include clinical examinations, blood samples, urine samples, dietary surveys, ECGs, and DNA.	Outcomes include CVD.
Michigan Long-Term PBB Study					
Michigan Department of Community Health, Emory University (Michele Marcus)	CDC, NIH, and US EPA	4,000 Michigan residents accidentally exposed to PBB in 1973, including 1,900 women and their daughters.	1977 (cohort identified)-2011; 1996-1999 additional study on EDCs conducted	Measurements include blood samples, health outcomes, and interviews.	Outcomes include effects of PBB on exposed women's reproductive health and chronic diseases including breast cancer.

Cohort Studies Related to Women's Health and the Environment

Institution (PI)	Funder(s)	Study Population	Study Period	Measurements	Health Outcomes
Multiethnic/Minority Cohort Study of Diet and Cancer					
University of Hawaii-Manoa (Laurence Kolonel)	NCI	215,000 men and women primarily of African-American, Japanese, Latino, Native Hawaiian, and Caucasian origin.	1993-2008	Measurements include a baseline survey, a subset of dietary surveys, and blood and urine samples for a subset (70,000).	Outcomes include breast and other cancers.
New York University Women's Health Study (NYUWHS)					
New York University School of Medicine (Anne Zeleniuch-Jacquotte)	NCI	14,274 women age 35-65 at enrollment (1985-1991).	Ongoing research: 1985-present	Measurements include baseline and follow-up questionnaires with a focus on environmental factors and a blood sample at recruitment.	Outcomes include breast cancer and other chronic diseases.
Nurses' Health Study I (NHS I)					
Channing/HMS/ Brigham and Women's Hospital (Susan Hankinson)	NCI, NIH	122,000 female, married registered nurses, age 30-55 in 1976, who resided in the 11 most populous states.	Ongoing research: 1976-present	Measurements include surveys every two years focusing on menopausal status, smoking and hormone use; dietary surveys (1980, 1984, 1986 and every four years since); Quality of Life surveys (1992 and every four years since); toenail samples (68,000 sets in 1982-1984); and blood (33,000 samples in 1989-1990 and 18,700 samples in 2000-2001).	Outcomes include breast and other cancers, CVD, and other chronic diseases and conditions.
Nurses' Health Study II (NHS II)					
HSPH (Walter Willett)	Originally NIH	116,686 female registered nurses age 25-42 in 1989.	Ongoing research: 1989-present	Measurements include surveys every two years focusing on oral contraceptive use, diet, smoking, pregnancies, and menopausal status; food frequency surveys start in 1991 and continue every four years since; Quality of Life surveys in 1993 and 1997; and blood and urine samples (30,000) in late 1990s.	Outcomes include breast cancer and other diseases.
Nurses' Health Study III (NHS III)					
Channing/HMS/HSPH (Walter Willett)	Internal funding	Female nurses (including RNs, NPs, and LPN/LVNs) and nursing students in the US and Canada (age 20-46). Goal of 100,000 participants.	New research (currently in recruitment/pilot study phase)	Measurements include web-based surveys every six months, and diet and lifestyle information for sub-study of women who become pregnant.	Outcomes include breast cancer and general chronic diseases.
Pathways Study					
Kaiser Foundation Research Institute (Lawrence Kushi)	NCI, DOD, American Cancer Society	Over 2,200 women who were at least 21 years old at breast cancer diagnosis with primary invasive breast cancer of any stage and no prior history of any cancer.	Ongoing research: 2006-present (recruitment 2006-2010)	Measurements include extensive baseline interview, blood and saliva samples; body measurements, self reported lifestyle updates, treatments, and outcomes every 12 to 24 months.	Outcomes include breast cancer survival, breast cancer recurrence, and response to chemotherapy.
Seventh-day Adventist Cohort Study: Cancer Epidemiology in Adventists - A Low Risk Group					
Loma Linda University School of Health Research (Gary Fraser)	Loma Linda University, World Cancer Research Fund	71,000 white and 25,000 black adult Seventh-day Adventists in the US.	Ongoing research: 2002-present	Measurements include questionnaires with special attention paid to diet. Some blood, urine and subcutaneous fat samples.	Outcomes include cancers of the breast, prostate, and colon.
Seveso Women's Health Study					
UC Berkeley (Brenda Eskenazi)	NIEHS	Women age 0-40 in 1976 who lived in Zones A or B during the Seveso Plant Explosion.	Ongoing research: 1996-present	Measurements include TCDD levels in serum, interviews focusing on reproductive history, gynecological examinations, bone density exams (subset), and clinical chemistries, including thyroid.	Outcomes include endometriosis, menstruation, menarche, menopause, fetal outcomes, breast cancer incidence, uterine function, ovarian function, diabetes and metabolic syndrome, bone density, and effects on women and neonatal thyroid hormones.

Cohort Studies Related to Women's Health and the Environment

Institution (PI)	Funder(s)	Study Population	Study Period	Measurements	Health Outcomes
Shanghai Women's Health Study (SWHS)					
Vanderbilt University (Wei Zheng)	NCI	74,942 Chinese women who were between ages 40 to 70 years at enrollment (1997-2000) and lived in urban Shanghai.	1997-2000	Measurements include surveys and biological samples (from 87.5% of participants).	Outcomes include breast and other cancers.
Singapore Chinese Health Study					
University of Minnesota (Jian-Min Yuan), National University of Singapore (Woon-Puay Koh), NIEHS (Stephanie J. London)	NCI	63,257 men and women, age 45-74, who were permanent residents or citizens of Singapore and who resided in government-built housing estates.	Ongoing research: 1993-present	Measurements include baseline survey, food frequency survey, demographics, current physical activity, reproductive history (women only), occupational exposure and medical history; and respiratory questionnaires; blood samples or buccal cell and spot urine samples (32,000); and blood, buccal, and urine samples from all incident cases of female breast and colorectal cancers beginning in April 1994.	Outcomes include respiratory effects and breast and other cancers.
Sister Study: Environmental and Genetic Risk Factors for Breast Cancer					
NIEHS (Dale Sandler, Clarice Weinberg)	NIEHS, National Center on Minority Health and Health Disparities	50,000 women age 35 to 74 who have never been diagnosed with breast cancer but who have a biological sister who has been diagnosed with breast cancer.	Ongoing research: 2003-present	Measurements include baseline questionnaire data, fasting blood, first morning urine, household dust samples and toenail samples. Follow up includes health status questionnaire surveys (annual) and health, lifestyle and exposures surveys (every two to three years).	Outcomes include breast and other cancers, osteoporosis, CVD, diabetes, and/or autoimmune diseases.
Southern Community Cohort Study					
Vanderbilt University (William Blot), Meharry Medical College, and IEI	NCI	86,000 residents, age 40 to 79, approximately two-thirds African American, of 12 southeastern US states.	Ongoing research: 2001-present	Measurements include baseline survey, blood samples, buccal samples and/or urine sample.	Outcomes include breast and other cancers and other common and chronic diseases.
Strong Heart Study					
University of Oklahoma Health Sciences Center	NHLBI	4,500 American Indians from 13 tribes and communities in three geographic areas (AZ, OK, SD/ND).	Phase I (1989-1991); Phase II (1993-1995); Phase III (1998-1999); Phase IV (90 more families); Phase V (additional families, ongoing)	Measurements include clinical examinations during each phase including blood samples, urine samples, EKGs, and blood pressure measurements.	Outcomes include CVD.
Swedish Mammography Cohort (SMC)					
National Institute of Environmental Medicine (Alicja Wolk)	National Institute of Environmental Medicine	Over 60,000 women living in two counties in central Sweden born between 1914 and 1948.	Ongoing research: 1987-present	Measurements include self-administered questionnaires, food consumption information, blood (subgroup), urine (subgroup), saliva (subgroup), and adipose tissue (subgroup).	Outcomes include chronic diseases, including breast and other cancers.
Women's Environment, Cancer, and Radiation Epidemiology (WECARE) Study					
Memorial Sloan-Kettering Cancer Center (Jonine Bernstein) and others	NIEHS	2,100 women with bilateral (700) and unilateral (1,400) breast cancer who were diagnosed prior to age 55.	Ongoing research: 2000-present	Measurements include questionnaire and blood samples for DNA analysis.	Outcomes include second (contralateral) primary breast cancer, with a focus on gene (ATM, BRCA 1/2)-environment (radiation) interactions.

Cohort Studies Related to Women's Health and the Environment

Institution (PI)	Funder(s)	Study Population	Study Period	Measurements	Health Outcomes
Women's Health Initiative Study (WHI)					
WHI (Staff; Ross Prentice)	NIH	161,808 generally healthy postmenopausal women ages 50-79 (68,132 clinical and 93,676 observational). 115,400 of these women are included in an extension study.	1991-2006; Extension Study until 2015	Measurements include a Randomized Clinical Trial (focusing on hormone therapy, diet, calcium/vitamin D), an Observational Study, a Community Prevention Study, clinical exams, blood samples, urine samples, and interviews.	Outcomes include CVD, breast and other cancers, and osteoporosis.
Women's Lifestyle and Health					
Department of Medical Epidemiology and Biostatistics, Tromsø University, Norway (Elisabete Weiderpass Vainio)	Swedish Cancer Society	50,000 Swedish women age 30 to 49.	1991-1992, 2003-2004	Measurements include questionnaire on lifestyle factors.	Outcomes include cancer, CVD and other chronic diseases in young women.
Women Physicians' Health Study					
Emory University School of Medicine (Erica Frank)	Varied sources, including American Heart Association and CDC	4,501 female physicians (stratified sampling for original 10,000 selected), ages 30 to 70.	1993-1994	Measurements include questionnaires.	Outcomes include health measures and health-related activities, as well as demographics and professional characteristics of US female physicians.

Cohort Studies Related to Women's Health and the Environment (Puberty)

Institution (PI)	Funder(s)	Study Population	Study Period	Measurements	Health Outcomes
Center for the Health Assessment of Mothers and Children of Salinas (CHAMACOS)					
UC Berkeley (Brenda Eskenazi)	Various	536 children born in 2000-2001 followed from birth; 300 children age 9 added in 2010-2011.	Ongoing research: 1998-present (funded through 2014)	Measurements include blood, urine, breastmilk, house dust, and deciduous teeth samples, as well as evaluations of breast development in girls age 9-12.	Outcomes include birth weight, neurodevelopmental endpoints, pubertal timing, hormone function, obesity, asthma, and immune function.
Children's Health and the Environment in the Faroes (CHEF)					
Harvard School of Public Health (Philippe Grandjean), Danish Institute of Public Health Department of Environmental Medicine (same), Faroese Hospital System Department of Occupational Medicine and Public Health (Pal Weihe), University of Southern Denmark	Arctic Monitoring and Assessment Program, DANCE, Danish Council for Strategic Research, Danish Medical Research Council, European Commission's Research Programme, US EPA, NIEHS	Cohort 1: 1022 children born 1986-1989; Cohort 2: 182 children born 1994-1995; Cohort 3: 656 children born in 1997-2000; Cohort 4: 148 children born 2000-2001; Cohort 5: 475 children born 2007-2009. All cohorts comprised children in the Faroe Islands and their mothers.	Ongoing research: 1986-present	Measurements include cord blood samples, multiple blood and hair samples from children, blood, hair, breast milk, and urine samples from mothers, and urine, hair, and semen samples from fathers, as well as questionnaire and health data. Biological samples have been analyzed for biomarkers of many organic chemicals and metals.	Outcomes include effects on growth and development, especially on neurobehavioral, cardiovascular, endocrine, and immunological functions. Includes data on puberty timing (Tanner staging, age at voice change).
Danish National Birth Cohort (DNBC)					
Danish Ministry of Health Statens Serum Institut	Danish National Research Foundation	~97,000 children born 1997-2002 in Denmark and their mothers.	Ongoing research: 1997-present	Measurements include maternal blood samples (during pregnancy), cord blood samples, and infant blood samples, as well as questionnaire and clinical data.	Outcomes include pubertal timing (age at menarche, age at voice change, Tanner stage), allergies, birth defects, childhood cancers, and other childhood health outcomes.
Duisburg Birth Cohort Study					
Ruhr-Universität Bochum (Michael Wilhelm)	North Rhine-Westphalia State Agency for Nature, Environment, and Consumer Protection, Environmental Agency of the Federal Republic of Germany	234 children and their mothers in Duisburg, Germany.	Ongoing research: 2000-2011	Measurements include cord blood samples, blood and urine samples from mothers and children, and breast milk samples from mothers, as well as questionnaire and clinical data. Biological samples have been analyzed for some persistent organic pollutants, endocrine disruptors, and hormones.	Outcomes include measurements of child development, including pubertal timing and sex hormone levels.
Environment and Childhood Project (Infancia y Medio Ambiente, or INMA)					
CREAL (Jordi Sunyer)	Multiple Spanish public health agencies and foundations	3,768 children and their mothers in seven areas of Spain.	Ongoing research: 1997-present (varies by cohort)	Measurements include biomarkers measured in cord blood, placenta, hair, and urine samples from children, biomarkers measured in maternal blood and urine, and questionnaires on parental occupation, diet, and lifestyle.	Outcomes include pubertal timing (assessed in ~400 children, planned for ~2000 more), growth, development, and asthma related outcomes.
Environmental and Genetic Determinants of Puberty					
Breast Cancer and the Environment Research Program (BCERP), Mt. Sinai School of Medicine (Mary Wolff), Kaiser Permanente (Lawrence Kushi), and Cincinnati Children's Hospital Medical Center (Frank Biro)	NIEHS, NCI	>1200 girls from East Harlem, NY, SF Bay Area, and Cincinnati area; age 6-8 at first visit.	Ongoing research: 2003-present	Measurements include hormonal changes, obesity, diet, family history, psychosocial stressors, environmental exposures (measured with biomarkers and otherwise), and genetic polymorphisms.	Outcomes include breast stages, menarche, peak height velocity, adult height, and menstrual cyclicity.

Cohort Studies Related to Women's Health and the Environment (Puberty)

Institution (PI)	Funder(s)	Study Population	Study Period	Measurements	Health Outcomes
German Infant Nutritional Intervention study – Plus influence of pollution and genetics on allergy development (GINIplus)					
Helmholtz Zentrum München - Institute of Epidemiology I (Joachim Heinrich), University of Munich (Sibylle Koletzko), Kinderklinik und Poliklinik, Technische Universität München (Carl P. Bauer), Marien-Hospital Wesel, Department of Pediatrics (Dietrich Berdel), Institut für Umweltmedizinische Forschung Düsseldorf (Barbara Hoffmann)	Federal Ministry of Education and Research, Germany, Helmholtz Zentrum München - Institute of Epidemiology I	5,991 healthy, full-term newborns with and without family history of allergy born in Munich and Wesel, Germany, 1995-1998 (3,317 at ten-year follow-up).	Ongoing research: 1995-present	Measurements include blood and urine samples from children, as well as questionnaire, anthropometric, and clinical data.	This study is focused on allergies, but outcomes include pubertal timing (age at menarche, Tanner stage at 15).
Influences of Life-style related factors on the Immune System and the development of Allergies in childhood – Plus the influence of traffic emissions and genetics (LISAplus)					
Helmholtz Zentrum München - Institute of Epidemiology I (J. Heinrich)	Partly by Public Health Forschungsverbund Bayern (BMBF), IUF	1,467 newborns from Munich, 976 from Leipzig, 348 from Wesel, and 306 from Bad Honnef; enrolled 1997-1999.	Ongoing research: 1997-present	Measurements include cord blood and blood samples from children, dust and air samples, and questionnaire, anthropometric, and clinical data.	This study is focused on allergies, but outcomes include pubertal timing (age at menarche, Tanner stage at 15).
Johns Hopkins Collaborative Perinatal Study (JHCPS)					
Johns Hopkins (Janet Hardy and Sam Shapiro), NIEHS (Matthew Longnecker, PI of DDE and PCBs Study)	NIEHS	Subset of NCCP mothers delivering at Johns Hopkins University Hospital between 1960-1965, their children until age 8, and grandchildren evaluated in 1992-1994.	1960-1994	Measurements include maternal blood samples, extensive questionnaires, language, speech, and behavior testing at 36 months, observations (in delivery room, 4 months, and 7 years), pediatric neurological exam at 12 months, psychological profiles, physical growth, and vision testing.	Outcomes include birth defects and other health endpoints to age 8.
Lessons in Epidemiology and Genetics of Adult Cancer from Youth (LEGACY Girls Study)					
Columbia University (Mary Beth Terry), Cancer Prevention Institute of California (Esther John), Fox Chase Cancer Center (Mary Daly), University of Utah (Sandra Buys), Samuel Lunenfeld Research Institute of Mount Sinai Hospital (Irene Andrusis)	NIH	900 girls age 6-13 (449 enrolled as of October 2012) and a parent or guardian followed for up to five years; half of the girls are daughters of women enrolled in the Breast Cancer Family Registry, half have no family history of breast cancer.	New research: enrollment began 2012, five years of follow-up planned	Measurements include biomarkers and epigenetics in blood, urine, and saliva, anthropomorphic measurements, and surveys.	Outcomes include pubertal and psychosocial development.
Millennium Cohort Study, UK (MCS)					
Institute of Education at University of London, Economic and Social Research Council (Heather Joshi)	UK Government (ESRC and others)	18,819 children and their families from across the UK.	Ongoing research: 2001-present; study team plans to follow cohort through adulthood	Measurements include surveys and basic tests to assess child's physical, cognitive, social, and emotional development.	Various health outcomes, early life dynamics.
Multicentre Allergy Study (MAS)					
Charité - University Medicine, Berlin (Ulrich Wahn), University Hospital Düsseldorf, St. Joseph's Hospital Freiberg, Johannes Gutenberg University Mainz, Technical University of Munich		1,314 newborns and parents enrolled in 1990 in Germany (Berlin, Munich, Freiburg, Mainz, Düsseldorf).	Ongoing research: 1990-present	Measurements include blood and urine samples, dust samples, and questionnaire and clinical data.	This study is focused on allergies, but outcomes include pubertal timing (age at menarche, Tanner stage).
National Children's Study					
NIH (Steven Hirschfeld), NIEHS, CDC, US EPA	HHS, NIH, CDC, US EPA	Pregnant women and their partners and couples planning to become pregnant, and their children. Has a goal of studying 100,000 children and their parents from child's birth to age 21.	Ongoing research: 2007-present	Measurements include biospecimens from children and parents, indoor air, dust, soil, and drinking water samples, physical/clinical examinations, and behavioral observations.	Outcomes include general health and development.

Cohort Studies Related to Women's Health and the Environment (Puberty)

Institution (PI)	Funder(s)	Study Population	Study Period	Measurements	Health Outcomes
New England NCPP (National Collaborative Perinatal Project) and follow-up New England Family Study					
HMS, HSPH (Stephen Buka), Brown University	NIH and others	17,000 individuals from NCPP, followed from birth to age 40.	Ongoing research: 1959-present	Measurements include periodic physical and mental health assessments and a series of cognitive, behavioral and social tests.	Outcomes mainly include mental health disorders with developmental origins, as well as substance use, learning disabilities, attention-deficit/hyperactivity disorder (ADHD), and cardiovascular disease.
North Carolina Infant Feeding Study/North Carolina Menopause Study					
NIEHS (Walter J. Rogan)	NIEHS	856 women enrolled during pregnancy (1978-1982), 600 children evaluated 1992-1997, and 514 women interviewed 2003-2004.	1978-2004	Measurements include PCB and DDE levels in blood and breast milk samples collected around delivery (856 women) and in blood samples collected around menopause (285 women).	Outcomes include childhood health and pubertal development of the children, and timing and other descriptors of menopause in the mothers.
Prevention and Incidence of Asthma and Mite Allergy (PIAMA)					
Utrecht University (Bert Brunekreef)	Asthma Foundation, ZONMW, MinVrom, RIVM++	>4000 pregnant women enrolled, children followed until age 8.	Ongoing research: 1996-2013	Measurements include blood and saliva samples from children and both parents, breast milk samples from mothers, and questionnaire and clinical data.	This study is focused on allergies and asthma, but outcomes include pubertal timing (age at voice change, pubertal stage).
The Stockholm Children Allergy and Environmental Prospective Birth Cohort Study (BAMSE)					
Karolinska Institutet, Stockholm County Council, Astrid Lindgren Children's Hospital, Sachs Children's Hospital	Stockholm County Council, Vårdal Asthma and Allergy Foundation, Swedish Research Council, EU MeDALL project.	4089 children and their parents born 1994-1996 in Stockholm, Sweden.	Ongoing research: 1994-present	Measurements include blood and urine samples as well as questionnaire and clinical data.	This study focuses on allergies and asthma, but measurements include pubertal timing (age at menarche, age at voice change, Tanner stage).

Abbreviations:

ACC	American Chemistry Council	NHLBI	National Heart, Blood, and Lung Institute
AFA	Association of Flight Attendants	NIA	National Institute on Aging
ATM	ataxia telangiectasia mutated gene	NICHHD	National Institute of Child Health and Human Development
ATSDR	Agency for Toxic Substances and Disease Registry	NIEHS	National Institute of Environmental Health Sciences
BCERF	Program on Breast Cancer and Environmental Risk Factors	NIH	National Institutes of Health
BRCA 1/2	breast cancer 1 and 2, early onset genes	NIOSH	National Institute for Occupational Safety and Health
CDC	Center for Disease Control	NYC	New York City
Channing	Channing Laboratory at Brigham and Women's Hospital/HMS	OCs	organochlorines
CVD	cardiovascular disease	PAH	polycyclic aromatic hydrocarbon
DDT	dichlorodiphenyltrichloroethane	PBB	polybrominated biphenyl
DES	diethylstilbestrol	PBDE	polybrominated diphenyl ether
DOD	Department of Defense	PCBs	polychlorinated biphenyls
EDC	endocrine disrupting compound	TCDD	2,3,7,8-tetrachlorodibenzo-p-dioxin
EKG	electrocardiogram	UC	University of California
ESRC	Economic and Social Research Council (UK)	UCLA	University of California at Los Angeles
HHS	United States Department of Health and Human Services	UK	United Kingdom
HMS	Harvard Medical School	US EPA	United States Environmental Protection Agency
HSPH	Harvard School of Public Health	USC	University of Southern California
IARC	International Agency for Research on Cancer	USDA	United States Department of Agriculture
IEI	International Epidemiology Institute	WHO	World Health Organization
NCI	National Cancer Institute		