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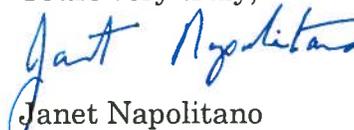
The Honorable Mark Leno
Chair, Joint Legislative Budget Committee
1020 N Street, Room 553
Sacramento, California 95814

Dear Senator Leno:

Pursuant to Section 104145 of the Health and Safety Code, I am pleased to enclose the University of California's report to the Legislature on the California Breast Cancer Research Program, 2010-2015.

If you have any questions regarding this report, Associate Vice President Debora Obley would be pleased to speak with you. She can be reached by telephone at (510) 987-9112, or by e-mail at Debora.Obley@ucop.edu.

Yours very truly,


Janet Napolitano
President

Enclosure

cc: Senate Budget and Fiscal Review
The Honorable Marty Block, Chair
Senate Budget and Fiscal Review Subcommittee #1
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(Attn: Ms. Cheryl Black)
The Honorable Kevin McCarty, Chair
Assembly Budget Subcommittee #2
(Attn: Mr. Mark Martin)
(Attn: Ms. Amy Rutschow)
Ms. Peggy Collins, Joint Legislative Budget Committee
Ms. Amy Leach, Office of the Chief Clerk of the Assembly
Mr. Jim Lasky, Legislative Counsel Bureau
Mr. E. Dotson Wilson, Chief Clerk of the Assembly
Mr. Daniel Alvarez, Secretary of the Senate
Mr. Michael Cohen, Department of Finance
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**Report from the California Breast Cancer Research Program
to the California Legislature: 2010–2015**

December 2015

**California Breast Cancer Research Program
Annual Report to the State of California Legislature 2015**

Report prepared by the University of California, Office of the President pursuant to Article 1 of Chapter 2 of Part 1 of Division 103 of the California Health and Safety Code

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Executive Summary

The California Breast Cancer Research Program (CBCRP) is an international leader in funding breast cancer prevention research and innovative areas of investigation. CBCRP's mission is to prevent and eliminate breast cancer by leading innovation in research, communication, and collaboration in the California scientific and lay communities.

This report provides an overview of the investments and progress made by the Program for the period of July 1, 2010, to June 30, 2015. It describes the strategies CBCRP used to determine the research topics that will make an impact on breast cancer and to identify the research projects that best address those topics. A summary of what was funded by priority area is summarized in Table 1.

Table 1: Research Funded from July 1, 2010 to June 30, 2015 by Priority Area

Priority Area	No. of Projects Funded	Funding Dollars	% of Total Funding
Etiology and Prevention	34	\$25,581,118	49%
Detection, Prognosis, and Treatment	48	\$12,874,384	25%
Community Impact of Breast Cancer	22	\$9,975,783	19%
Biology of the Breast Cell	20	\$3,402,556	7%
Grand Total	124	\$51,833,841	100%

CBCRP celebrated its 20th anniversary in 2013. Established with passage of the 1993 Breast Cancer Act, CBCRP was created because California breast cancer activists were impatient with the slow pace of progress against the disease. Together with scientists, clinicians, state legislators, and University of California officials, they wrote legislation that created a program to fund cutting-edge breast cancer research in California. The California Breast Cancer Act increased the tobacco tax by 2¢ per pack, with 45 percent of the revenue going to CBCRP. Today, funding comes from diverse sources in addition to the tobacco tax. See Table 2 for details.

Table 2: CBCRP Income, 2010–2015

Fiscal Year	2010–2011	2011–2012	2012–2013	2013–2014	2014–2015	5-Year Summary
Breast Cancer Research Account (007) ALLOCATION	\$8,303,000	\$9,959,000	\$9,959,000	\$11,058,000	\$10,563,000	\$49,842,000
California Breast Cancer Research Fund (0945) ALLOCATION	\$434,000	\$484,000	\$484,000	\$618,000	\$421,000	\$2,441,000
EXTERNAL FUNDING*	\$1,002,862		\$10,000		\$216,000	\$1,228,862
PRIVATE DONATIONS	\$139,457	\$111,286	\$112,768	\$112,207	\$115,915	\$591,633
TOTAL FUNDS	\$9,879,319	\$10,554,286	\$10,565,768	\$11,788,207	\$11,315,915	\$54,103,495

* 2010–2011, National Institute of Environmental Health Sciences (NIEHS) grant 1RC4ES019826-01 and Avon Foundation for Women grant; 2012–2013, NIEHS and National Cancer Institute Conference Award 1 R13 ES022921-01; 2014–2015, NIH grant 1R25CA188482-01

The need for CBCRP is as urgent today as when we began in 1993. Nearly 200,000 California women are living with breast cancer. Breast cancer can affect women of all ages and races, and approximately 80 percent of women who develop breast cancer have no family history of the disease. In California alone, more than 4,200 women die of breast cancer every year—that is more than 11 women **every day** who die from the disease.

Despite the ongoing breast cancer crisis in California, there is reason for hope. CBCRP has contributed to significant progress in its understanding of breast cancer through its program-initiated research efforts designed specifically to push the field forward in new areas. Devoting 30 percent of its annual research funding over six years to program-initiated research, in 2004 CBCRP launched the Special Research Initiatives. In 2010, CBCRP decided to build on the success of this approach with the California Breast Cancer Prevention Initiative and devoted about half of its funding over five years to program-initiated research in some of the most challenging and under-researched areas in breast cancer: the role of the environment in the disease; the reasons why some groups of women—based on characteristics such as ethnicity or race—bear a greater burden of breast cancer; and breast cancer prevention. In 2015, CBCRP recommitted to maintaining about half of its funds over the next five years focused on prevention-oriented, program-initiated research. This program-directed approach to research has yielded significant breakthroughs in the field, some of which are documented throughout this report.

CBCRP has focused the other half of its research funding on investigator-initiated research, allowing investigators to bring creative approaches and unique perspectives to bear on questions that will improve breast cancer prevention, treatment and survivorship. CBCRP has significantly helped advance the field of community based participatory research through the Community Research Collaboration (CRC) awards. Innovative, Developmental and Exploratory (IDEA) awards have supported speculative, exploratory, high-risk/high-reward projects. The Translational Research awards support research that is on a critical path for practical application. The combination of program and investigator initiated awards has created a robust portfolio of breast cancer research.

Due in part to the cutting edge research CBCRP funds related to breast cancer prevention, specifically around the role of environmental exposures and uncovering the causes driving the unequal burden of breast cancer incidence, mortality and survivorship, several significant shifts have happened in the field of breast cancer. The shift in the national prioritization of the research agenda is evidenced by The Institute of Medicine release of *Breast Cancer and the Environment: A Life Course Approach* (commissioned by Susan G. Komen for the Cure) and the federal Interagency Breast Cancer & Environmental Research Coordinating Committee's release of *Breast Cancer and the Environment: Prioritizing Prevention*. CBCRP has also provided leadership to the International Cancer Research Partnership (ICRP) to focus on environmental links to cancer as well as to inform the agenda set by the American Cancer Society. The fact that these prestigious, national and international leaders are prioritizing these issues speaks to the impact CBCRP's development work and funded research has had.

In recognition of the contributions that CBCRP has made, the program was recognized in 2011 at the National Coalition for Cancer Survivorship's 25th Annual Rays of Hope® Gala winning its most prestigious award, the Catherine Logan Award for Service to Survivorship. In 2014, CBCRP was recognized by Money Magazine for leadership in research quality, accountability, and integrity. The magazine identified CBCRP as one of five charitable organizations that are making the biggest impact against breast cancer.

What is Covered in this Report

This report has been prepared by the University of California, pursuant to California Health and Safety Code, Section 104145 and the Revenue and Taxation Code Sections 18791-18796 and 30461-30462.1. The following required reporting elements will be addressed in this report:

1. **The number and dollar amounts of research grants, including the amount allocated to indirect costs.** From July 1, 2010, through June 30, 2015, CBCRP provided 124 single- and multiple-year research projects, totaling nearly \$52 million in direct and indirect costs, funded in the form of 166 grants at 46 California institutions.
2. **The institutions and campuses receiving grant awards.** All funded grants with recipient institutions are listed in Section IV: Funding Highlights.
3. **The subject of research projects.** All of the projects funded by CBCRP involve key questions in one or more of the following research areas:
 - Community Impact on Breast Cancer (sociocultural behavioral studies and health policy);
 - Breast Cancer Cause and Prevention;
 - Earlier Detection, Diagnosis and Treatment of Breast Cancer; and
 - Basic Biology of the Breast (normal breast biology and breast cancer pathogenesis).
4. **The relationship between federal and state funding for breast cancer research.** CBCRP takes several steps to avoid duplication of funding at the individual research project level and in the Program's research priorities. CBCRP identifies and attempts to fill important gaps in knowledge about breast cancer. At the start of each priority setting process, CBCRP reviews priorities in light of changes in the research field, successes and failures of previous funding initiatives, and the results of previous funding. Additionally, as founding members of the International Cancer Research Partnership, CBCRP funding complements, rather than duplicates, grants bestowed by other funding organizations.

CBCRP's Breast Cancer Research Council sets the Program's funding priorities, taking into account:

- Opinions from national breast cancer experts;
- Opinions from California advocates and activists, healthcare providers, public health practitioners, community leaders, biotechnology scientists, and academic researchers;
- Current literature on breast cancer and current gaps in knowledge;
- Comparisons with portfolios and programmatic goals of other funding agencies; and
- In-house evaluations of the efficacy of CBCRP grant mechanisms and topic areas in fulfilling program goals

5. **The relationship between each project and the overall strategy of the research program.** The following ten goals are used to set overall programmatic research priorities and calls for applications:
- **California Specific:** Fund research that utilizes resources particular to California and/or addresses a breast cancer need that is specific, but not necessarily unique, to the burden of breast cancer in California.
 - **Capacity-building:** Fund research that helps recruit, retain, and develop high quality California-based investigators who engage in breast cancer research.
 - **Collaboration:** Fund research that uses multi-disciplinary approaches and helps foster collaboration among California scientists, clinicians, advocates, community members, patients, survivors, and others.
 - **Disparities and Underserved:** Fund research that addresses disparities, inequalities, and/or underserved populations in California.
 - **Innovation:** Fund innovative research (e.g., new drugs, new strategies, new paradigms, new technologies, new applications of tested strategies in new populations and contexts).
 - **Non-Duplicative:** Fund research that complements, builds on, and/or feeds into, but is not duplicative of other research programs.
 - **Policy:** Fund research and evaluation that will have policy implications for breast cancer in California.
 - **Public Health Outcomes:** Fund research that will improve public health outcomes (e.g., preventing breast cancer, identifying environmental links to breast cancer, detection of breast cancer, effective treatments, and quality of life).
 - **Responsive:** Fund research that is responsive to the perceived breast cancer research needs, opportunities, and expectations of CBCRP as identified by scientists and the public in California.
 - **Translation and Dissemination:** Fund research that is on a critical path for practical application and leads to more effective products, technologies, interventions, or policies and their application and delivery to Californians.

The review of each individual grant application is also designed to ensure that the research projects funded by CBCRP have both high scientific merit and programmatic interest. Each individual application is evaluated by external scientific review committees for specific aspects of scientific merit including, but not limited to, impact on breast cancer, innovation, feasibility, and approach. All applications of sufficient scientific merit undergo a programmatic review by our Breast Cancer Research Council for responsiveness to program priorities, including whether it fits the goals of the award type, integrates advocacy issues, and addresses an under-funded research field.

6. **A summary of research findings including discussion of promising new areas.** Highlights of funded research that has concluded during this period are included in the body of this report. Listed below are a few of the findings:

- **Toward an Ecological Model of Breast Cancer Causation and Prevention:** In the quest to identify the cause of breast cancer, scientists often investigate one factor at a time—but it is becoming increasingly clear that many factors interact with one another to contribute to the disease. It can be hard for decision makers, scientists and the public to sort through the research to fully understand the causal

context of breast cancer. Through the [New Paradigm of Breast Cancer Causation and Prevention](#) research initiative, **Robert Hiatt** at UCSF led a team in the creation of a breast cancer causation model that reflects the complexity of these interactions. The model was developed through a collaboration of scientists who synthesized evidence from scientific literature to offer their expert understanding of the relationships important to new cases of post-menopausal breast cancer causation. This model is interactive, allowing decision makers, researchers and members of the public to explore connections and develop a conceptual framework for research (<http://www.cbcrp.org/research-topics/causal-model.html>). This model has proved successful and compelling enough that a second phase of research was funded.

- **Environmental Causes of Breast Cancer across Generations:** The *Three Generations Study* is a follow-up study of women whose mothers enrolled in the Child Health and Development Studies between 1959 and 1967. The study looks at causes of breast cancer and other diseases affecting women that may pass from one generation to the next or be caused by things in the environment. **Barbara Cohn** and her team at the **Public Health Institute** tested the idea that prenatal exposure to environmental chemicals increases the risk of breast cancer by evaluating 54 years of data from women. Cohn assessed data from 9,300 women who had been tracked prior to birth and identified 118 women diagnosed with breast cancer. For the first time researchers were able to show: 1) there is direct evidence that daughters who had been exposed to significant levels of DDT (dichlorodiphenyltrichloroethane) during pregnancy were four times as likely to have had breast cancer as their counterparts who had been exposed to a smaller quantity of the pesticide; and 2) that exposure to environmental toxins *in utero* affect adult breast cancer risk. These findings were publicized in numerous influential publications.
- **Making Chemical Testing Relevant to Breast Cancer:** Through this initiative, the **City of Hope** developed a screening test that can analyze 16 times as many chemicals as conventional means. The test—called AroER tri-screen™—can quickly analyze up to 1,536 compounds' effect on estrogen and aromatase, an enzyme that converts androgen to estrogen. The research team, led by **Shiuan Chen**, discovered that the antidepressant paroxetine (Paxil) acts as an estrogen promoter. This is especially important because women are commonly prescribed anti-depressants when they have been diagnosed with breast cancer. Based on its excellent technical and biological performance characteristics, AroER tri-screen assay has been selected by the US Environmental Protection Agency for screening the Tox21 10K compound library for identification of aromatase inhibitors-like Endocrine Disrupting Chemicals.
- **Cost-effectiveness Analysis to Inform BC Screening Policy:** Over the last five years, Every Woman Counts (EWC), a California breast cancer screening program, faced challenging budget cutbacks and policy choices. Breast cancer health programs for underserved women are faced with increasing need for services and declining budgets. Making effective policy choices can have significant impacts on how many women are served and how well they are served. Carefully constructed computer modeling can be useful in projecting potential outcomes of policy and budgetary choices. **Joy Melnikow** of UC Davis has

developed a computer interface to enable breast cancer policy makers, advocates, and researchers to choose program parameters and receive immediate feedback on the costs and outcomes of policy alternatives they are considering. This project is aimed at creating a user-friendly tool that will help to integrate research evidence into health policy making. Using this model, researchers were able to find that for the EWC program, biennial screening mammography starting at age 50 years was the most cost-effective strategy.

- **Light at Night and Breast Cancer Risk among California Teachers:** There has been convincing evidence that exposure to light at night (LAN) promotes mammary carcinogenesis in rodents for some time; however, the role that light at night plays in increasing human breast cancer risk has been less understood. **Peggy Reynolds** at **Cancer Prevention Institute of California** analyzed data from the California Teachers Study participants to determine that women living in the areas with very high levels of outdoor LAN had about a 10 percent increased risk of breast cancer compared to women who lived in areas with the lowest levels of indoor LAN. Findings like these can have significant implications for people who work night shifts or who live in urban areas.
- **Combating Breast Cancer with the Wellderly Immune Repertoire:** What can healthy, older adults teach us about breast cancer? **Brunhilde Felding** of the **Scripps Research Institute** took a unique approach to explore this question by examining blood samples of the “wellderly” —healthy adults over 80 years of age—to understand the reasons for their long life. By studying antibodies, she was able to identify footprints, or memories of past victories against cancer, specifically triple negative breast cancer, which currently lacks effective treatment options. Understanding how the wellderly have naturally fought off the disease provides important opportunities to developing effective therapies to treat this aggressive form of breast cancer.
- **Stratifying DCIS Biopsies for Risk of Future Tumor Formation:** **Thea Tlsty** and her team at **UCSF** have discovered a way to predict whether women with ductal carcinoma in situ (DCIS) —the most common form of non-invasive breast cancer—are at risk for developing more invasive tumors in later years. Historically, women diagnosed with DCIS have often received aggressive treatments such as chemotherapy, radiation or mastectomy, though it is becoming increasingly clear that this may not be necessary for everyone. Not all cases of DCIS develop into life-threatening breast cancer. However, without a reliable screen for the risk each person’s DCIS poses, doctors and patients have often opted for interventions. It is hoped that these findings will give women with DCIS the opportunity to be more selective about their treatment. Findings were published in the *Journal of the National Cancer Institute* in May 2010, *Cancer Prevention Research* in May 2010, *Cancer Prevention Research* in February 2010 and *Breast Cancer Research* in December 2009.

Fiscal Overview

The program operates below a 5 percent administrative cap. For funding allocations distributed between July 1, 2010 and June 30, 2015, CBCRP devoted 4 percent to administration, 10 percent to program activities and 86 percent to grants. Tables 3 and 4 provide specific details of how moneys have been spent from funds allocated in the past five years.

Table 3: Grants and Initiatives Funded

Fiscal Year	2010–2011	2011–2012	2012–2013	2013–2014	2014–2015	5-Year Summary
CYCLE	17	18	19	20	21	
CORE GRANTS AWARDED	20 projects	19 projects	17 projects	14 projects	2 projects	72 projects
<i>Direct Cost Total</i>	\$3,965,367	\$4,713,936	\$3,361,980	\$3,249,696	\$36,299	\$15,327,278
<i>Indirect Cost Total</i>	\$1,909,380	\$608,016	\$1,266,915	\$1,139,795	\$0	\$4,924,106
<i>Pending Grants (funding decisions made before 7/1/2015)</i>					\$5,131,717	
<i>Total Grant Costs</i>	\$5,874,747	\$5,321,952	\$4,628,895	\$4,389,491	\$36,299	\$20,251,384
PROGRAM INITIATIVES						
Special Research Initiatives Awarded/ Contracts	6 projects					6 projects
<i>Direct Cost Total</i>	\$4,230,972					\$4,230,972
<i>Indirect Cost Total</i>	\$1,598,279					\$1,598,279
<i>Total Grant Costs</i>	\$5,829,251					\$5,829,251
California Breast Cancer Prevention Initiatives Awarded/ Contracts			1 project	1 project	5 projects	7 projects
<i>Direct Cost Total</i>			\$717,640	\$791,936	\$4,027,070	\$5,536,646
<i>Indirect Cost Total</i>			\$116,305	\$67,495	1,268,479	\$1,452,279
<i>Total Grant Costs</i>			\$833,945	\$859,431	\$5,295,549	\$6,988,925
<i>Pending Initiative Grants (RFPs released in 2015)</i>					\$11,091,500	
TOTAL GRANT FUNDS Disbursed*	\$11,703,998	\$5,321,952	\$5,462,840	\$5,248,922	\$5,331,848	\$33,069,560

*Totals do not include grants that were funded in 2010 from fiscal allocations made prior to July 1, 2010.

Table 4: Administrative and Program Expenditures

Fiscal Year	2010–2011	2011–2012	2012–2013	2013–2014	2014–2015	5-Year Summary
CYCLE	17	18	19	20	21	
Administration	\$405,658	\$374,900	\$357,741	\$517,552	\$472,005	\$2,127,856
% Total Funds	4.1%	3.6%	3.4%	4.4%	4.2%	4.0%
Research Support and Evaluation	\$950,748	\$1,139,738	\$1,630,129	\$1,172,162	\$1,222,708	\$5,757,744
% Total Funds	10.7%	10.8%	12.1%	9.9%	10.8%	10.1%

Summary

This report gives an in-depth description of the many ways that CBCRP has advanced the field of breast cancer research. With more than 20 years of experience, its work has empowered community groups to engage in research that directly affects their lives, helped identify several specific and controllable factors that increase risk for breast cancer (allowing for meaningful interventions to protect women), and advanced understanding of how breast cancer develops and new ways to detect the disease. The work is far from over, but this report provides important insight into just how much has been accomplished.

I. About the California Breast Cancer Research Program

Nearly 200,000 California women are living with breast cancer. Breast cancer can affect women of all ages and races, and approximately 80 percent of women who develop breast cancer have no family history of the disease. In California alone, more than 4,200 women die of breast cancer every year—that's more than 11 women **every day** who die from the disease. See Figure 1 and 2 for details.

The California Breast Cancer Research Program's (CBCRP) mission is to prevent and eliminate breast cancer by leading innovation in research, communication, and collaboration in the California scientific and lay communities. Established by the California Legislature with passage of the 1993 Breast Cancer Act, CBCRP was created because California breast cancer activists were impatient with the slow pace of progress against the disease. Together with scientists, clinicians, state legislators, and University of California officials, they wrote legislation that created a program to fund cutting-edge breast cancer research in California. The California Breast Cancer Act increased the tobacco tax by 2¢ per pack, with 45 percent of the revenue going to CBCRP.

Since then, CBCRP has made California a leader among states for breast cancer research. The Program is the largest, most stable state-funded breast cancer research effort in the nation. Since 1993, CBCRP has awarded over 1000 grants to 108 scientific institutions and community entities, totaling more than \$260 million for research in California to prevent, treat, and cure breast cancer. From July 1, 2010, through June 30, 2015, CBCRP awarded nearly \$52 million for 124 single- and multiple-year research projects at 46 California institutions. Ninety-five percent of our revenue goes directly to funding research and education efforts.

CBCRP is administered as a public service by the University of California. CBCRP's staff manages the solicitation, review, award, and oversight of grants and dissemination of research results, working under the administration of the University of California, Office of the President, in Oakland. By being housed in the Office of the President Research Grants Program Office, CBCRP shares grant making and financial management resources and personnel with the Tobacco-Related Disease Research Program, California HIV/AIDS Research Program and the UC Research Initiatives programs. This allows CBCRP to leverage administrative support in the form of financial, grant management, and legal services. It is part of the reason that CBCRP is able to keep its administrative costs low.

Funding for CBCRP comes primarily from a state tax on tobacco, a steadily declining source of revenue due to decreasing consumption of tobacco products. This funding is supplemented with taxpayer donations contributed through state income tax forms and by private contributions. Ninety-five percent of our revenue goes directly to funding research and education efforts. Administration is under 5 percent and other activities (programmatic, educational) are under 10 percent. See Table 5 for an overview of income and administrative and program expenditures.

Table 5: Income and Administrative and Program Expenditures

Fiscal Year	2010–2011	2011–2012	2012–2013	2013–2014	2014–2015	5-Year Summary
CYCLE	17	18	19	20	21	
TOTAL INCOME	\$9,879,319	\$10,554,286	\$10,565,768	\$11,788,207	\$11,315,915	\$54,103,495
Administration	\$405,658	\$374,900	\$357,741	\$517,552	\$472,005	\$2,127,856
% Total Funds	4.1%	3.6%	3.4%	4.4%	4.2%	4.0%
Research Support and Evaluation	\$950,748	\$1,139,738	\$1,630,129	\$1,172,162	\$1,222,708	\$5,757,744
% Total Funds	10.7%	10.8%	12.1%	9.9%	10.8%	10.1%

Figure 1: CA Breast Cancer Incidence Rates, All Races (Including Hispanic), Female, All Ages, 2008–2012

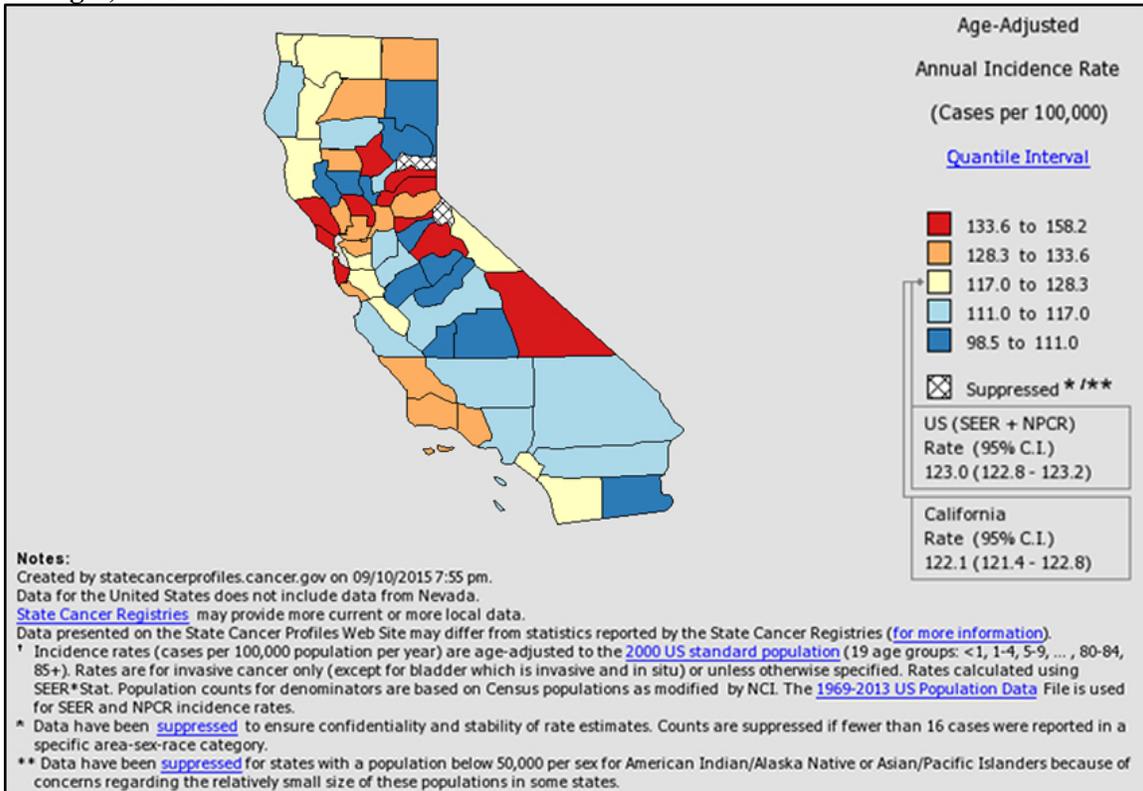
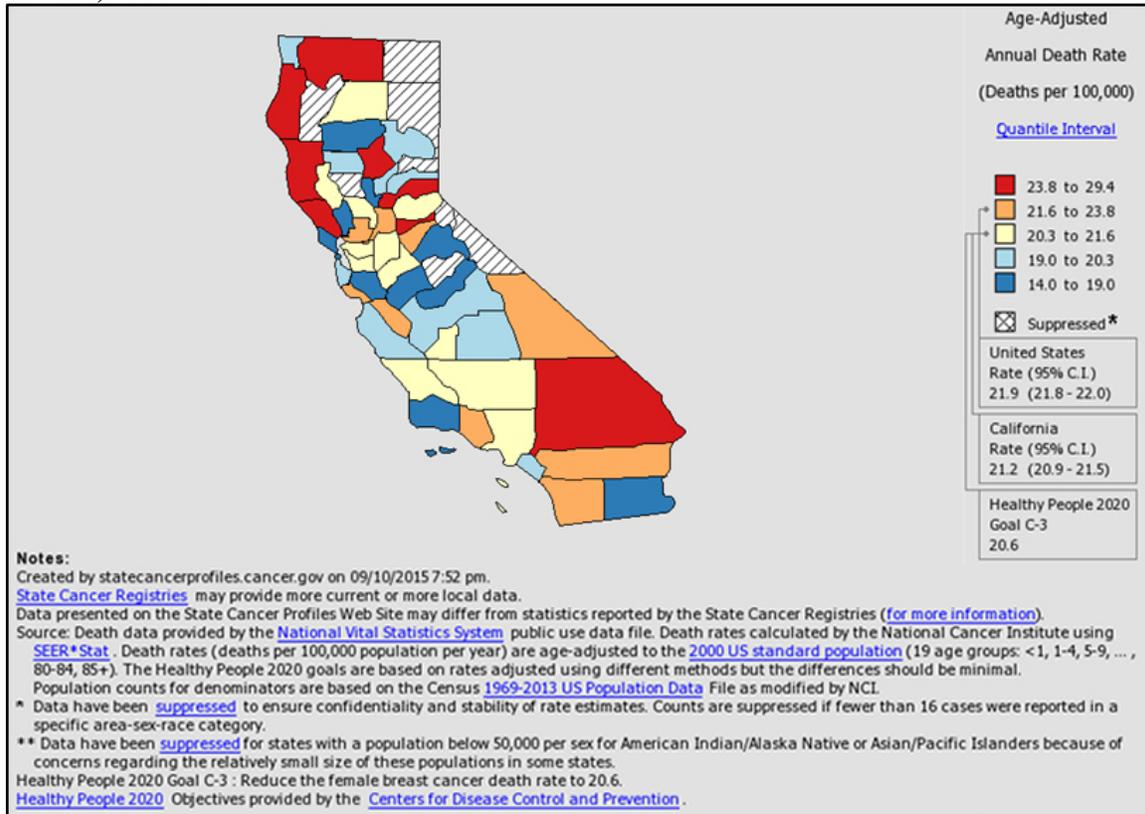


Figure 2: CA Breast Cancer Age-adjusted Death Rates, All Races (Including Hispanic), Female, 2008–2012



Funding Philosophy

During its 22-year history, CBCRP has established a track record for funding innovative research ideas that have led to successes. These successes include a CBCRP-funded researcher winning a Nobel Prize, investing in capacity to build research collaborations between members of California's diverse communities and scientific researchers to conduct research, informing national policy, and serving as a model for other funding agencies.

While CBCRP is not as large as some of the national breast cancer research funders, its impact is significant in California and around the world. As Janet Napolitano, president of the University of California, has said: “As California goes, so often goes the world. It's also true that as the University of California goes, so goes California... We *teach* for California, and *research* for the world...” CBCRP is proud of the global impact it has had in promoting a breast cancer research agenda that prioritizes the disease’s prevention more than any other funder in the world.

CBCRP remains committed to advancing cutting-edge research focused on the prevention of breast cancer. CBCRP plans to be an innovator in breast cancer research until breast cancer is a thing of the past.

Commitment to Incorporating Diverse Input

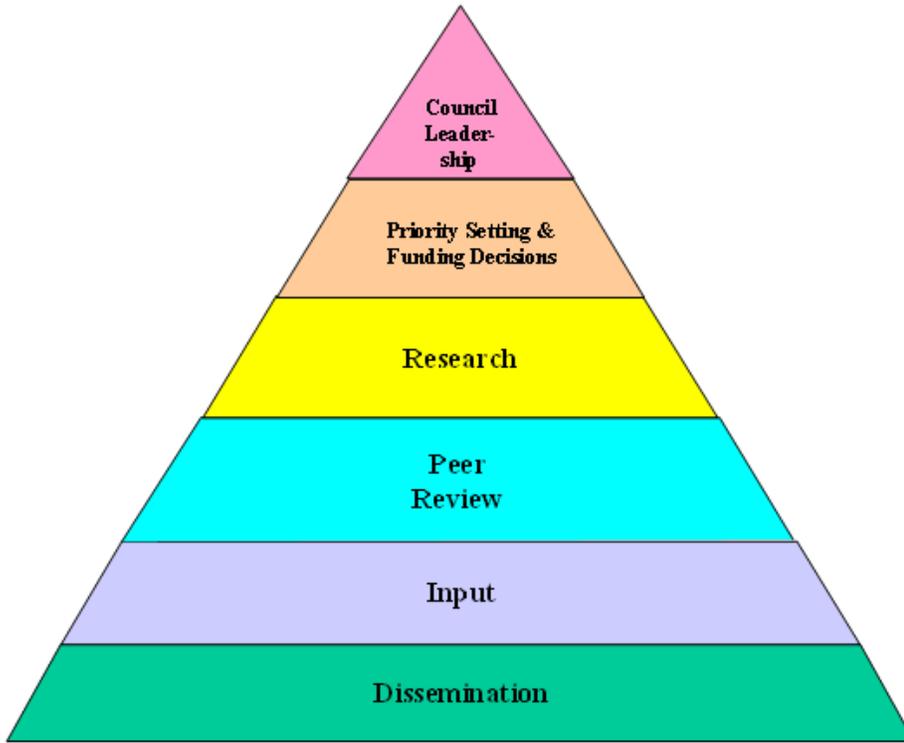
From the beginning, CBCRP has been structured to welcome and encourage input from a broad range of constituents, including community members. Breast cancer advocates, who sparked the creation of the Program, continue to play a critical role in every aspect of CBCRP's work, from setting research priorities to recommending research projects for funding and getting out the word about research results (see Figure 3). The Program's structure has inspired other research funding agencies around the nation to follow CBCRP's example. Other agencies are now more likely to include community advocates in the review of research proposals and to involve community members in the design and conduct of research.

Any Californian concerned about breast cancer has opportunities to help set the strategic direction of CBCRP's work via several avenues of engagement and feedback:

- **Breast Cancer Research Council:** CBCRP's Breast Cancer Research Council (Research Council) includes scientists, clinicians, representatives of industry and nonprofit health organizations, and breast cancer advocates serving overlapping three-year terms. The Research Council provides vision, sets research priorities, and makes decisions on how CBCRP invests funds in research. The Research Council also conducts one of the two reviews that every proposal must pass to receive funding. Research Council members review research proposals for relevance to CBCRP's goals, while teams of research scientists and breast cancer advocates from outside California review all proposals for scientific merit.
- **Advocate involvement:** CBCRP requires that breast cancer or other appropriate community advocates be actively involved in funded research. Grant applicants are required to collaborate with advocates affiliated with an organization, regardless of the specific topic of their research. Advocates from outside California participate in the peer review of every application, and California-based advocates represent one-third of CBCRP Research Council membership.
- **Community-engaged research:** CBCRP funds the Community Research Collaboration Awards, which support research conducted as an equal partnership between community groups and scientists. Community members and researchers work together to identify the research questions, conduct the study and disseminate the results. See Section IV: Funding Highlights 2010–2015 for details.
- **Community input in strategic planning:** CBCRP goes through regular planning processes to guide funding strategies. CBCRP invites feedback from the broader community into the planning process.

By bringing the research, advocacy, and treatment communities into closer collaboration, CBCRP pushes the boundaries of research, mobilizing greater creativity and resources toward decreasing—and ending—the suffering and death caused by breast cancer.

Figure 3: Involvement of Breast Cancer Advocates in CBCRP



II. CBCRP's Strategy for Allocating Research Funds

As a Program committed to innovation and addressing unmet needs in the field of breast cancer research, CBCRP Research Council and staff regularly evaluate breast cancer research gaps and achievements and undertake strategic planning to ensure that CBCRP is stimulating meaningful and unique research. See Appendix 1 and 2 for Research Council and staff lists, respectively.

To date, CBCRP has undergone three thorough strategic planning processes: in 2002, 2010 and 2015. Each planning process has both affirmed CBCRP's investment and worked toward ongoing evaluation and improvement. These processes shape CBCRP's strategic approach and allow it to ensure that research effectively progresses in all four areas that CBCRP was founded to address:

1. The Community Impact of Breast Cancer
2. Etiology and Prevention
3. Detection, Prognosis and Treatment
4. Biology of the Breast Cell

Planning allows CBCRP to identify areas where it is effective in supporting investigators to advance the field of breast cancer research as well as determine research topics that are not being sufficiently supported by other funding organizations. Additionally, the planning process allows CBCRP to identify areas to reduce or eliminate funding if other funders are supporting them sufficiently.

Each strategic planning process follows five major steps:

1. Review the CBCRP mission statement and reaffirm the program's foundation of long-term outcomes;
2. Review and revise the priority criteria (see Figure 4) and, if necessary, the data questions that will be used to determine how well each criterion is being addressed by the funding strategy;
3. Gather and analyze pertinent data as indicated by the priority criteria and data collection questions;
4. Identify and make decisions on long-term (5 year) priorities through a data-driven, group decision-making process; and
5. Incorporate priority decisions into CBCRP operational plans and award cycles.

The first evaluation and planning process in 2002 resulted in significant shifts in how CBCRP prioritized funding. There were two pressing concerns that needed to be addressed:

- Declining income into the future due to reduced cigarette purchases, which required in part the identification of ways to have impact with fewer resources; and
- Per stakeholder feedback, insufficient research dedicated to the causes and prevention of breast cancer as well as disparities in mortality among different ethnic and racial groups – at that time it was the smallest portion of CBCRP's portfolio.

Figure 4: CBCRP’s Funding Priority Criteria (listed alphabetically)

CBCRP uses the following criteria to determine which award types (described later in the report) to offer for research funding. These criteria are set by the CBCRP Research Council. While not all efforts funded by CBCRP will meet every one of these criteria, evaluation and planning helps ensure that the complete body of work funded by CBCRP collectively addresses these criteria.

- **California Specific:** Fund research that utilizes resources particular to California and/or addresses a breast cancer need that is specific but not necessarily unique to the burden of breast cancer in California.
- **Capacity-building:** Fund research that helps recruit, retain, and develop high quality California-based investigators who engage in research that advances CBCRP initiatives.
- **Collaboration:** Fund research that uses multi-disciplinary approaches and helps foster collaboration among California scientists, clinicians, advocates, community members, patients, survivors, and others.
- **Disparities and Underserved:** fund research that addresses disparities, inequalities, and/or underserved populations in California.
- **Innovation:** Fund innovative research (e.g., new drugs, new strategies, new paradigms, new technologies, new applications of tested strategies in new populations and contexts).
- **Non-Duplicative:** Fund research that complements, builds on, and/or feeds into, but is not duplicative of other research programs.
- **Policy:** Fund research and evaluation that will have policy implications for breast cancer in California.
- **Public Health Outcomes:** Fund research that will improve public health outcomes (e.g., preventing breast cancer, identifying environmental links to breast cancer, detection of breast cancer, effective treatments, and quality of life) focusing on population interventions.
- **Responsive:** Fund research that is responsive to the perceived breast cancer research needs, opportunities, and expectations of CBCRP as identified by scientists and the public in California.
- **Translation and Dissemination:** Fund research that is on a critical path for practical application and leads to more effective products, technologies, interventions, or policies and their application and delivery to Californians.

To address these concerns, CBCRP decided to reduce funds for investigator-initiated awards by 30 percent in order to establish its program-initiated funding stream, called the Special Research Initiatives (SRIs). SRIs addressed two research areas:

1. The effects of the environment on the development of breast cancer; and
2. Disparities in breast cancer, i.e., the reasons why some groups of women are more likely to get breast cancer or to die from the disease.

The research funded through SRIs was completed during the period this report covers and is detailed below in Section IV: Funding Highlights 2010–2015.

The second evaluation and planning process in 2010 confirmed the effectiveness of program-initiated awards and increased the commitment from 30 to 50 percent of the available funding. The most recent planning process in 2015 affirmed the 2010 strategy and CBCRP's commitment to allocating 50 percent of its funding to program-initiated research.

An overview of the new strategic directions for both investigator-initiated and program-initiated research is described below.

Investigator-initiated Research

Investigator-initiated research funds are awarded through a range of award types. In the 2002, 2010 and 2015 planning processes, CBCRP evaluated the effectiveness of each award type. Based on this analysis, some award types were modified to maximize their ability to address priority criteria, while others were discontinued. For example, in the 2010 planning process, CBCRP decided to eliminate career development awards (postdoctoral fellowships and dissertation support) and IDEA renewal awards (which allow researchers to expand on data developed in their initial IDEA award, described below) because they could be funded through other agencies.

CBCRP solicits applications from researchers (and in the case of Community Research Collaboration awards (CRC), community-scientist member teams) based in California for five different types of investigator-initiated research. Below is a description of the types of investigator-initiated funding mechanisms CBCRP used during this reporting period and the rationale for ongoing support. Actual funding outcomes are detailed in Section IV: Funding Highlights 2010–2015.

- **Community Research Collaborations:** CBCRP allocates \$2 million annually to support community-based participatory research (CBPR) that enables community groups and academically-trained scientists to jointly answer important breast cancer questions. It found that CRC awards effectively help address underserved populations and address issues that are often missing in research. This is likely due to the involvement of communities in the research and a requirement for projects to address issues important to them.
- **Innovative, Developmental, and Exploratory Awards (IDEAs):** The IDEA grants are used to fund the beginning stages of novel projects (e.g., new drugs, new strategies, new paradigms, new technologies, new applications of tested strategies in new populations and contexts), establish new collaborations, develop new technologies, or adapt technologies from other fields to breast cancer research. Applicants must show how their

project is part of a longer-term research process that will lead to practical applications, such as breast cancer diagnosis, treatment, or prevention. Through June 2015, the Program had invested over \$37 million for 228 IDEAs, which comprises almost one-quarter of all grants funded to date and 16 percent of all funds invested. In a survey conducted of IDEA grantees in 2013, 10 of 13 responding investigators produced publications from their funded studies. Additionally, IDEA awards create opportunities for newer researchers by focusing the peer review on the innovation of the idea rather than the track record of the investigator, which gives junior investigators and established researchers an equal playing field. In the 2015 strategic planning process, CBCRP committed to maintain funding for IDEAs at \$100,000 to \$150,000 (animal and human participants) with an 18-month duration. Looking ahead, IDEA award recipients will be required to describe the public health outcomes of their research.

- **Translational Research Awards:** These awards fund research that is on a critical path for practical application and leads to more effective products, technologies, interventions, or policies and their application and delivery to Californians. This research takes basic science findings and applies them quickly toward treatment, diagnosis, prevention or another application that can directly impact breast cancer, either in a medical clinic setting or through a public health measure. Areas of focus include:
 - Prevention, detection, diagnosis or treatment of breast cancer;
 - Improved quality of life for survivors;
 - Reduction in the social burden caused by the disease in California; and
 - Advances in medical practices, health systems changes, health policies or environmental modifications.

To ensure that these studies are truly translational, CBCRP requires applicants to present a critical path that maps how the project fits along a defined research continuum leading to practical applications. To date, the Program has funded 12 Translational awards. Eight are complete and two more will be completed in the coming year. Preliminary assessment of completed Translational awards indicates the funding mechanism is meeting many of the expected outcomes. The most promising area of translational research supported by CBCRP has been projects that seek to stratify and accurately predict outcomes for women diagnosed with ductal carcinoma in situ (DCIS). Moving forward, a greater emphasis will be placed on describing the public health outcomes of these awards.

- **Conferences:** CBCRP conference awards are designed to support events that bring together people with different perspectives who do not usually meet and exchange views with the expectation that the experience will lead to new research projects and new collaborations. CBCRP funds up to \$50,000 per year in conferences/events that address issues related to breast cancer and that do one or more of the following:
 - Highlight resources particular to California,
 - Encourage new collaborations,
 - Recruit high quality researchers to the field,
 - Examine and create solutions for disparities/inequities,
 - Inspire paradigm-shifting research,
 - Inform policy,
 - Promote translational and/or outcome driven research, or
 - Create tools for educating members of the public about breast cancer.

Program-initiated Research

CBCRP began distributing program-initiated awards in 2009 (through SRIs). Based on the success of SRIs we re-confirmed this strategic direction in the 2010 planning process and established the California Breast Cancer Prevention Initiative (CBCPI). The planning process we just completed in early 2015 further demonstrated the success of issuing program-initiated funds, and led to the establishment of a third round of program-initiated research. These are described in further detail below.

California Breast Cancer Prevention Initiative (2010–2015)

Evaluation of SRIs pointed to both the success of SRIs and two ways to strengthen CBCRP's program-initiated research:

- Increasing available funds from 30 to 50 percent would allow for greater impact; and
- Expanding focus to include breast cancer prevention, specifically the following areas:
 - Identifying and eliminating environmental causes of breast cancer;
 - Identifying and eliminating disparities/inequities in the burden of breast cancer in California;
 - Population-level interventions (including policy research) on known or suspected breast cancer risk factors and protective measures; and
 - Targeted interventions for high-risk individuals, including new methods for identifying or assessing risk.

Additionally, the Research Council decided that the development of CBCPI should be coordinated by an external researcher. After a competitive application process, Tracey Woodruff, Professor and Director of the UCSF Program on Reproductive Health and the Environment (PRHE) was chosen to lead the effort.

The planning process took four years to complete (2010–2014) and was informed by a diverse set of stakeholders and experts, including CBCRP staff and the Research Council, PRHE staff, an eight-person steering committee that contributed heavily to defining the research concepts and providing significant input into their development, as well as 15 strategy advisors who were consulted based on their relevant expertise. Names of Strategy Advisors and Steering Committee members are available in Appendix 3.

The process was guided by focused literature reviews and input on prioritized research questions from a broad audience, including Strategy Advisors, stakeholders and Steering Committee members. Once topics had been chosen, PRHE and CBCRP staff and consultants worked with Strategic Advisors and Steering Committee members to develop full concept proposals (descriptions of research topics with background, rationale and funds available). Once the Steering Committee approved the concept proposals, they were submitted to the Research Council for approval. The CBCPI process is documented in the July 15, 2015, issue of *Reproductive Toxicology* in an article titled "[California Breast Cancer Prevention Initiatives: Setting a research agenda for prevention.](#)"

In total, 15 concept proposals with a combined allocation of \$24 million were approved by the Research Council to be developed into competitive Requests for Submissions offered through 2017. See Table 6 for details of concept proposals approved through CBCPI.

Table 6: Approved Concept Proposals Developed through CBCPI (numbers in parenthesis indicate maximum potential project numbers and allocation for the topic)

Research Area	Concept Proposal Topics
Identify and eliminate environmental causes of breast cancer.	<ol style="list-style-type: none"> 1. Examining Hormone Concentrations of Interest to Breast Cancer Risk in California's Beef (1 project, \$310,200) 2. Testing for Potential Breast Toxins in California's Drinking Water (1 project, \$846,000) 3. Women Firefighters Biomonitoring Collaborative Study (1 project, \$833,945)* 4. Occupational Chemical Exposures in California and Breast Cancer Risk (1 project, \$1,551,000) 5. Chemical Safety Testing to Reduce Breast Cancer Risk (5 projects, \$5,436,671)* 6. New Paradigm Model for Breast Cancer: Phase II (1 project, \$859,431)*
Identify and eliminate disparities/inequities in the burden of breast cancer in California.	<ol style="list-style-type: none"> 7. Early Life Adversity and Risk of Breast Cancer (1 project, \$846,000) 8. Multigenerational Study on Behavioral, Biological, Social and Environmental Factors Influencing Breast Cancer Risk in California's Immigrants (1 project, \$3,384,000) 9. Animal Models for Concurrent Effects of Environment and Stress Factors on Mammary Cancer (2 projects, \$1,762,500) 10. Community-Driven Studies of Racial/Ethnic Disparities in Consumer Product Availability, Access, and Use (2 projects, \$846,000)
Population-level interventions (including policy research) on known or suspected breast cancer risk factors and protective measures.	<ol style="list-style-type: none"> 11. The Impact of Chemical Policy to Reduce or Eliminate Exposures Linked to Breast Cancer (4 projects; \$1,692,000) 12. California's Comprehensive Breast Cancer Primary Prevention Plan (1 project, \$423,000) 13. Preventing Developmental Exposure to Ionizing Radiation from Medical Imaging (3 pilots, \$634,500) – (full funding of one full-scale project – \$4,230,000 depending on outcome of pilots and if funding is available)
Targeted interventions for high-risk individuals, including new methods for identifying or assessing risk.	<ol style="list-style-type: none"> 14. Improve Breast Cancer Risk Assessment to Identify High-Risk Individuals (4 projects, \$3,384,000) 15. Identify Novel Biological Markers of Breast Cancer Risk Related to Environmental Chemical Exposures (3 projects, \$4,230,000)

* Indicates that funds have already been distributed for these research topics.

Program Initiative 3 (PI3) (2016–2022)

The planning process completed in March 2015 re-confirmed CBCRP’s commitment to allocate 50 percent of its funding to program-initiated research. The research areas of priority are consistent with CBCPI, though with slight revisions to include:

- Identification and elimination of environmental contributors to breast cancer,
- Identification and elimination of fundamental causes of health disparities with a focus on breast cancer in California, and
- Development and testing of population-level interventions intended to prevent breast cancer.

The multi-year planning process will be directed by program staff with input from a steering committee, national experts, a community advisory board and CBCRP’s Research Council.

CBCRP’s Overall Portfolio

The combination of program-initiated and investigator-initiated awards results in unique, high impact research that advances understanding in basic breast cancer biology, possible prevention interventions and the social and human impact of the disease. Table 7 gives an overview of the total annual allocations of funding distributed by CBCRP by award type.

Table 7: CBCRP Annual Allocations by Funding Mechanisms

Award Type	Annual Allocation	Initiator	Funding Focus
Community Research Collaboration Awards	Approx. \$2 million	Investigator initiated	Supports community-scientific partnerships in conducting research.
Translational Research Awards	Approx. \$2 million shared between mechanisms	Investigator initiated	Supports practical applications of research, such as clinical applications, policy, support for survivors, etc.
Innovative, Developmental & Exploratory Awards		Investigator initiated	Supports challenging existing paradigms, represents a new direction for the Principal Investigator and encourages innovation by the incorporation of techniques and approaches not yet well represented in mainstream breast cancer research.
Conference Awards	Approx. \$50,000	Investigator initiated	Supports conferences that further the field of breast cancer prevention and care.
California Breast Cancer Prevention Initiative Awards	Approx. \$4 million	Program Initiated	Supports research focused on priorities set by a panel of experts to move the field of breast cancer prevention forward.

III. Relationship between Federal and State Funding for Breast Cancer Research

CBCRP is distinct from research programs funded by the federal government in both the sources of funding and in the types of research funded.

CBCRP’s Source of Funding: Unique Among the Nation’s Breast Cancer Research Agencies

The primary source of funding for CBCRP is a 45 percent share of revenue from a 2¢ State tax on cigarettes. This source of funding is unique among agencies that fund breast cancer research across the nation. See Table 8 for a description of CBCRP income between July 1, 2010 and June 30, 2015.

Table 8: CBCRP Income, 2010–2015

Fiscal Year	2010–2011	2011–2012	2012–2013	2013–2014	2014–2015	5-Year Summary
Breast Cancer Research Account (007) ALLOCATION	\$8,303,000	\$9,959,000	\$9,959,000	\$11,058,000	\$10,563,000	\$49,842,000
California Breast Cancer Research Fund (0945) ALLOCATION	\$434,000	\$484,000	\$484,000	\$618,000	\$421,000	\$2,441,000
EXTERNAL FUNDING*	\$1,002,862		\$10,000		\$216,000	\$1,228,862
PRIVATE DONATIONS	\$139,457	\$111,286	\$112,768	\$112,207	\$115,915	\$591,633
TOTAL FUNDS	\$9,879,319	\$10,554,286	\$10,565,768	\$11,788,207	\$11,315,915	\$54,103,495

* 2010–2011, National Institute of Environmental Health Sciences (NIEHS) grant 1RC4ES019826-01 and Avon Foundation for Women grant; 2012–2013, NIEHS and National Cancer Institute Conference Award 1 R13 ES022921-01; 2014–2015, NIH grant 1R25CA188482-01

In contrast, funding for breast cancer research at other programs in the U.S. comes from a variety of different sources:

- **Federal Agencies** (National Institutes of Health, Department of Defense) receive funding through Congress from the national budget and from the public’s voluntary purchase of more expensive postage stamps;
- **National Voluntary Health Organizations** (such as the American Cancer Society, Komen Foundation, Breast Cancer Research Foundation, Avon Foundation for Women) receive funding through charitable contributions from individuals, corporations, and foundations;
- **Regional Nonprofit Organizations** (such as the Entertainment Industry Foundation, The Wellness Foundation) also receive funding through charitable contributions; and
- **State Agencies** (such as the New Jersey Breast Cancer Research Fund, Illinois Ticket for the Cure State Lottery, and the Cancer Prevention and Research Institute of Texas, the latter of which includes breast cancer) receive funding from state general funds, auto

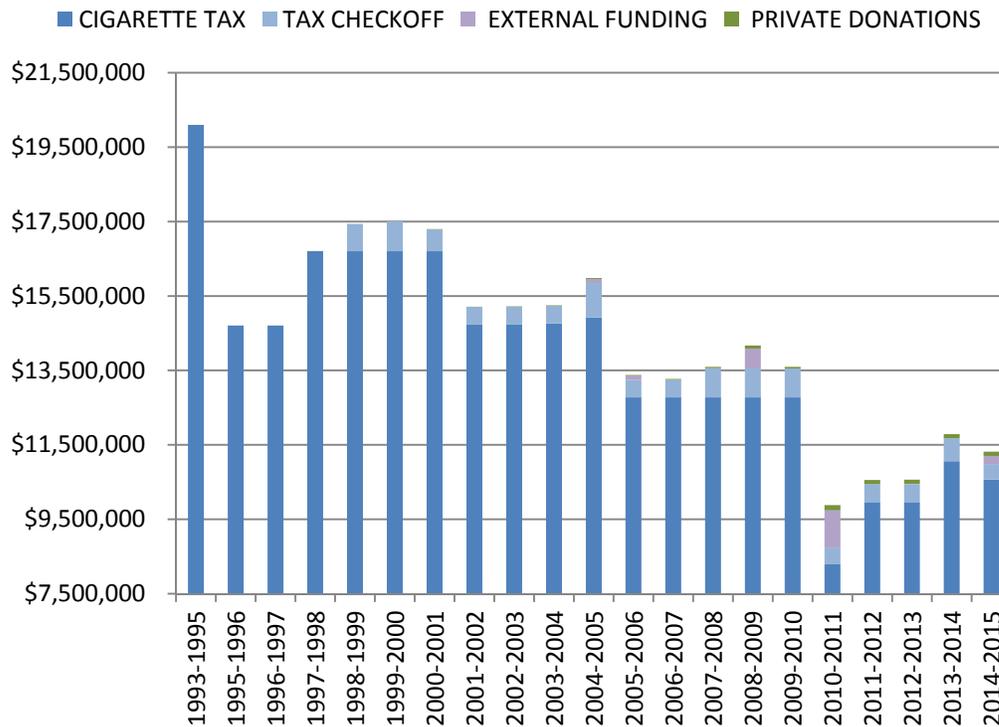
license fees, lottery ticket sales and voluntary donations on individual state income tax returns.

The California Breast Cancer Research Program's primary source of funds, a State cigarette tax, is declining due to reductions in smoking. Measures were proposed in the California State Legislature that would have directly or indirectly decreased funding for CBCRP. Similar measures may be proposed, and may pass, in the future. In order to maintain funding, CBCRP has therefore turned to additional funding sources.

CBCRP also receives funding from the income tax checkoff program, which allows individuals to make voluntary donations on state income tax returns. This was a result of legislation passed by the California State Legislature that authorized donations for five years. In 2007, AB28, authored by Assembly Member Jared Huffman, became law, providing individuals the opportunity to make donations to CBCRP via voluntary tax contributions through 2012. In 2012, Senate Bill 1359, sponsored by State Senator Joe Simitian, extended the voluntary contribution check-offs on state tax forms for the California Breast Cancer Research Fund (CBCRF) and the California Cancer Research Fund for five years. Without SB 1359, these popular check-offs would have expired on January 1, 2013. The longevity of the CBCRF does have a drawback. The minimum total contributions required for the fund to remain on the tax form increases every year and by 2013 the CBCRF had the largest minimum requirement of all of the funds on the form. Assemblymember Nancy Skinner introduced A.B. 1286, which amended Section 18796 of the Revenue and Taxation Code to hold the minimum contribution requirement at the 2013 level for two years.

To increase these sources of revenue, CBCRP conducts a public outreach and fundraising effort, the Community Partners Program. This effort, begun in 2002, has led to an increase in donations to CBCRP from individuals, businesses, and foundations. CBCRP's Community Partners Program is discussed more fully in the Section VI: Activities to Increase Funding for Breast Cancer Research and Awareness of Breast Cancer Research. See Figure 5 for an overview of CBCRP's sources of revenue since the program's inception.

Figure 5: CBCRP Funding Sources, 1993–2015



CBCRP Funding Complements Federal Efforts

CBCRP has a deep commitment to using the funds provided by the State of California in the most efficient and cost-effective manner, and to adhering to the Program’s mandate as defined by the California Legislature. One of CBCRP’s mandates is to “fund innovative and creative research, with a special emphasis on research that complements, rather than duplicates, the research funded by the federal government.” CBCRP fulfills this mandate in four ways:

1. By funding breast cancer research areas that could have a major impact on breast cancer—including leading to prevention and cure—that are not getting sufficient attention from the federal government;
2. By having expert reviewers from across the U.S. review grant applications for their innovation and impact;
Before funding a grant application, reviewing it for overlap with current and pending funding from other agencies; and
3. By taking leadership in reducing duplication in state, federal, and international breast cancer research funding

These four ways of assuring that CBCRP-funded research does not duplicate federally-funded research are each discussed in more detail below.

Funding Research Gaps

The federal government's method for funding research has resulted in some promising areas of breast cancer research being under-funded. The federal government funds most health-related research through the National Institutes of Health (NIH). Most research proposals submitted to the NIH address scientific questions in which the investigators have theoretical and empirical interest, even though there may be no immediate connection to particular diseases. This is the "plant many seeds" approach that has born many truly innovative and groundbreaking discoveries.

CBCRP employs a different and complementary approach, which is to fund scientifically meritorious research that is focused on speeding progress in preventing and curing breast cancer specifically. CBCRP's Research Council sets the Program's funding priorities, taking into account:

- Opinions from national breast cancer experts;
- Opinions from California advocates and activists, healthcare providers, public health practitioners, community leaders, biotechnology scientists, and academic researchers; and
- Current literature on breast cancer and current gaps in knowledge

The Research Council attempts to identify important research questions that could lead to breakthroughs and that have not received sufficient attention. CBCRP is conducting program-initiated research to fill a significant gap in breast cancer research. CBCRP is addressing three overlapping research questions that California is uniquely positioned to address through program initiated research. They are the environment's role in breast cancer, the reasons for the unequal burden of breast cancer among various populations of women, and breast cancer prevention. More information on these projects is found in Section II: CBCRP's Strategy for Allocating Research Funds.

Choosing Research for Innovation and Impact

To allow the Program's expert reviewers to differentiate applications that are especially innovative and that have the most potential impact on breast cancer, CBCRP created its own scoring system. The scoring system has improved the Program's ability to choose the most innovative and creative research for funding.

In the past, the majority of research funding agencies, including the NIH, scored funding proposals with a single score based solely on scientific merit. With this method, an application with an excellent research plan to test an idea that was not particularly novel could receive the same score as an application with a flawed research plan to test a novel idea. CBCRP's scoring method, based on the recommendations of an NIH Advisory Committee, can distinguish these two applications. CBCRP scores applications separately for innovation, impact, approach and any qualities that are specific to the award type. The separate scores are then used to inform funding decisions. For example, under CBCRP's "impact" criterion, researchers are required to describe the steps necessary to turn their research into products, technologies, interventions, or policies that will have an impact on breast cancer, and describe where their study fits into this critical path. Since CBCRP developed its pioneering scoring system, the NIH has also abandoned the single scientific merit score and developed a system that rates specific application qualities such as innovation and significance.

Reviewing Grant Proposals for Overlap with Federal Funding

As a final step to ensure that CBCRP-funded research doesn't duplicate federally-funded research, breast cancer science experts in other states and CBCRP program officers review all grants recommended for funding for overlap with current and pending federal grants. If overlap with federal funding is found, the overlapping grant (or portion of the grant) is not funded.

Taking Leadership to Reduce Duplication in Federal, State, and International Funding

CBCRP is part of an international effort to reduce duplication in cancer research. This effort, the International Cancer Research Partnership (ICRP), includes more than \$50 billion in cancer research funding distributed by over 100 government and charitable research funding agencies in the U.S., United Kingdom, Canada, the Netherlands, Australia and Japan. The organizations that make up the ICRP are working to speed progress by increasing communication and avoiding duplication among agencies that fund cancer research.

One way ICRP pursues these goals is through a research classification system to encourage agencies to report their funding in an accessible and meaningful way. The ICRP web site (<https://www.icrpartnership.org/>) includes research abstracts from more than 75,000 current and past research projects totaling more than \$50 billion in research. The online database is searchable by cancer type, scientific area, funding organization, and other criteria. The web site allows scientists to identify possible collaborators and plan their research based on current research, as well as facilitate dialogue among cancer researchers. Access to information about ongoing research also aids research-funding organizations in strategic planning. In addition, the web site is a useful tool for other groups. Policy makers may use the database during the formulation of new health care and service delivery policies. Healthcare professionals, patients, survivors, and advocates may review the current status of funded research. CBCRP investigators are required to use the database to describe how their proposed project is distinct from the research being funded through all of these organizations.

ICRP has also taken international coordination to a higher level. In addition to an updated report on the overall cancer research funding trends in the U.S, U.K., Canada, France and the Netherlands, the partnership has published evaluations of international funding trends on topics that include metastatic breast cancer, environment and breast cancer, as well as operational best practices <https://www.icrpartnership.org/publications.cfm>. ICRP partners are actively exploring additional opportunities to analyze research outcomes, identify prospects for collaboration and refine best operational practices across funding agencies. CBCRP requires that Principal Investigators consult ICRP's database and describe how their proposals are distinct from work that is already funded to ensure that their proposals are truly breaking new ground.

IV. Funding and Research Highlights, 2010–2015

CBCRP is recognized as an innovative funder that addresses gaps in the field. CBCRP prioritizes funding in areas that many other breast cancer research funders either ignore or under-fund. For example, the report, *Breast Cancer and the Environment: Prioritizing Prevention*, released in 2013 by the Interagency Breast Cancer and Environmental Research Coordinating Committee (IBCERCC) said:

“Environmental justice continues to be a broad public health issue and has not been integrated adequately into research, public health actions, or regulatory policies related to breast cancer. Examples of effective projects and programs that seek to alleviate environmental injustices, however, do exist....One such program is the CBCRP, which has made considerable efforts to fund projects in areas where there are research gaps with regard to environmental exposures, health disparities, prevention, and translation and community-based projects.”

This vanguard approach to funding has allowed CBCRP’s grantees to raise awareness and address important questions about what might be contributing to the high prevalence of breast cancer in the U.S. Below are highlights of some of the 124 CBCRP-funded research projects that were funded between 2010 and 2015, and an additional 75 that were funded before July 1, 2010 and were active during this period. As these examples show, CBCRP-funded research has influenced chemical testing and policy development at the national level, improved understanding of risk factors that contribute to breast cancer, identified reasons for differences in mortality rates from breast cancer, improved treatment of metastatic breast cancer, and fostered the development of more informative prognostic markers and ways to detect breast cancer.

As mentioned above, CBCRP has four priority areas for research that are funded through a range of award types. Table 9 provides an overview of funding investments made in each of our four priority areas. Table 10 provides an overview of funding made through different award types. This section provides highlights of progress made through the SRIs, followed by sections giving greater detail on funding by priority area.

Table 9: Research Funded from July 1, 2010 to June 30, 2015 by Priority Area

Priority Area	No. of Projects Funded	Funding Dollars	% of Total Funding
Etiology and Prevention	34	\$25,581,118	49%
Detection, Prognosis, and Treatment	48	\$12,874,384	25%
Community Impact of Breast Cancer	22	\$9,975,783	19%
Biology of the Breast Cell	20	\$3,402,556	7%
Grand Total	124	\$51,833,841	100%

Table 10: Research Funded from July 1, 2010 to June 30, 2015 by Award Type

Award Type	No. of Projects Funded	Funding Dollars	% of Total Funding
Program-initiated Research	18	\$25,331,780	48.9%
IDEA	58	\$11,786,430	22.7%
Translational Research Award	7	\$5,980,828	11.5%
CRC Full Research Award	6	\$4,303,077	8.3%
CRC Pilot Award	13	\$2,534,455	4.6%
IDEA Competitive Renewal**	3	\$984,463	1.9%
Postdoctoral Fellowship***	5	\$390,240	0.8%
Dissertation Award*	5	\$333,271	0.6%
Joining Forces Conference Award	9	\$189,297	0.4%
CRC Conference Award	1	\$150,418	0.3%
Grand Total	124	\$51,833,841	100%

* 2010 was the last year Dissertation Awards were given.

** 2011 was the last year IDEA Competitive Renewal Awards were given.

*** 2010 was the last year Postdoctoral Fellowships were given.

The Grant-making Process

For all grants, the Research Council selects research to fund based on recommendations from expert committees who review all research applications for scientific merit. To minimize conflicts of interest, review committees are composed of experts from outside California. These experts include scientists highly knowledgeable about the topics of the applications they consider. Each review committee also has advocate reviewers. These are women and men active in breast cancer advocacy organizations, many of them also living with the disease. The committees use a review process based on established practices at the federal government's National Institutes of Health, but tailored to focus on assessing the qualities of the applications that are important to CBCRP (e.g., impact on breast cancer, translation potential). CBCRP's review process is one of a handful of non-federal peer review systems certified by the National Cancer Institute to meet the NIH standards of peer review and funding. The members of CBCRP's review committees for 2010–2015 are listed in Appendix 4 of this annual report.

A. Funding and Research Detail: The Special Research Initiatives

Funding of research needs identified in SRIs has had a significant impact in moving the field of breast cancer research forward. To date, SRIs-funded projects have met goals and produced products or tools that can be used to better understand the connections between, and create solutions to, breast cancer and the environment and the unequal burden of the disease.

Most researchers funded through SRIs have produced papers in peer-reviewed literature and made presentations at scientific meetings based on their findings. Some have disseminated findings to a lay audience. A few projects have been able to leverage additional funding, although most of the SRIs projects have just recently closed or are about to close. Therefore, another assessment of whether the SRIs projects are successful in leveraging additional funding will be useful to implement in the next three years.

SRI's impact has reached the national level. By investing in research into environmental links to breast cancer, CBCRP has informed national efforts to grapple with the challenge of understanding the contributions of the environment to breast cancer through analyses such as the Institute of Medicine's report, *Breast Cancer and the Environment: A Life Course Approach* (commissioned by Susan G. Komen for the Cure) and the federal Interagency Breast Cancer & Environmental Research Coordinating Committee of the National Institute of Environmental Health Sciences *Breast Cancer and the Environment: Prioritizing Prevention*. CBCRP has also provided leadership to the International Cancer Research Partnership (ICRP) to focus on environmental links to cancer as well as to inform the agenda set by the American Cancer Society.

With nine distinct initiatives, SRI's have proved to be effective investments in moving the field of breast cancer research forward. In total, 27 grants totaling approximately \$22 million were awarded to address the environmental causes of breast cancer and the unequal burden of the disease. Below are highlights of a selection of research projects CBCRP has funded through the SRI's, followed by Table 11 and 12, which provide funding details of research funded through the SRI's and CBCPI's that was concluded and in progress, respectively, between 2010 and 2015.

SRI Initiative 1: Understanding Racial and Ethnic Differences in Stage-Specific Breast Cancer Survival

This project, known as The California Breast Cancer Survivorship Consortium (CBCSC) was funded for \$2,728,665. It was established as a collaborative effort between **Beckman Research Institute at City of Hope, Kaiser Research Institute, Cancer Prevention Institute of California and University of Southern California** that leverages data collected by six California-based studies of over 12,000 breast cancer patients. The inclusion of breast cancer cases from four racial/ethnic groups (African Americans, Asian Americans, Latinas, and non-Latina Whites) offered a unique opportunity to study the individual, clinical, and contextual factors as potential determinants of the observed survival disparities across racial/ethnic groups. These studies explored the interaction of factors (tumor, individual, social, environmental, genetic) which account for racial and ethnic differences in stage-specific survival among women diagnosed with breast cancer in California and sought to identify whether these factors lead to higher risks in certain racial and ethnic groups than in other groups. Overall, researchers found meaningful differences in breast cancer survival based on racial/ethnic differences in some areas and not in others. Highlights include:

- **Neighborhood Environment and Breast Cancer Survival**
Differences were found between the impact of a person's neighborhood on breast cancer survival based on race. For example, non-Latina white women living in lower socioeconomic status neighborhoods had a higher breast cancer mortality rate, whereas African American women in similar neighborhoods had a lower mortality rate. No neighborhood associations were found for Asian Americans. For Latinas, crowded neighborhoods and multifamily housing increased risk for breast cancer mortality. Findings were published in *Cancer, Epidemiology, Biomarkers and Prevention* in August 2015.
- **History of Recreational Physical Activity and Survival After Breast Cancer**
Women who were physically active before a breast cancer diagnosis had an overall lower risk of mortality and a significantly reduced risk of mortality from cardiovascular disease. No association was observed for *breast cancer* mortality. These findings were true for all

racess/ethnicities. Overall, the findings suggest that physical activity is beneficial for all breast cancer survivors but does not impact their breast cancer. Findings were published in *American Journal of Epidemiology* in June 2015.

- **Diabetes and Other Comorbidities in Breast Cancer Survival**

Risk of breast cancer-specific mortality increased among breast cancer cases with a history of diabetes. Risk patterns were similar across race/ethnicity (non-Latina White, Latina, African American and Asian American), body size, menopausal status, and stage at diagnosis. Findings were published in *Cancer, Epidemiology, Biomarkers and Prevention* in February 2015.

- **Obesity and Mortality after Breast Cancer**

The relationship between weight and breast cancer mortality differs by race. For example, for non-Latina white women, being underweight increased risk of mortality in breast cancer survivors, though only morbid obesity in Latinas was associated with higher risk of mortality. No BMI-mortality associations were apparent in African Americans and Asian Americans. This study was highlighted by the National Cancer Institute Epidemiology and Genomics Research division as having great potential scientific and/or public health impact. Findings were published in *American Journal of Epidemiology* in January 2014.

These findings give us greater insight into what does and does not contribute to the higher rates of mortality seen in some racial/ethnic groups.

SRI Initiative 2: Demographic Questions for California Breast Cancer Research

While there is a general understanding that breast cancer affects different groups of people in different ways, the lack of a standard approach to data collection has slowed progress in understanding breast cancer disparities and what can be done about them. CBCRP invested \$430,588 to speed progress in disparities research. To address this, **Scarlett Gomez** of **Cancer Prevention Institute of California** and **Nancy Krieger** of **Harvard University** developed a standardized survey instrument to collect data such as an individual's race, ethnicity, birthplace, migration history, language, literacy, numeracy, community characteristics, disability status, socioeconomic status, gender, and sexual orientation. The survey has been translated into Spanish, Chinese, Tagalog and Vietnamese. With standardized ways to measure demographic information, scientists can more effectively compare their results across studies, leading to new knowledge about how the unequal burden of breast cancer in the population can be eliminated.

SRI Initiative 3: Piloting an Integrated Approach to Understanding Behavioral, Social and Physical Environment Factors and Breast Cancer among Immigrants

This initiative devoted \$722,098 to explore links between immigrant status and breast cancer risk. The award was given to **Scarlett Gomez** at **Cancer Prevention Institute of California** and focused specifically on the increasing incidence rates of breast cancer among Asian Americans in California by exploring risk factors like diet and weight gain, and new risk factors, including infectious exposures, family and community contexts, and social stressors related to the immigration process, being an immigrant, and discrimination. The study found that breast cancer rates are high among young U.S.-born women, rapidly increasing among some U.S.-born and foreign-born groups, and in some cases, are even higher among non-Hispanic white women in California. Investigators are continuing this project and have set up a website for the Asian Community Health Initiative (<http://www.asianchi.org>) to recruit for a three-year study that will

enroll 350 Asian American cases (those with breast cancer) from a previous breast cancer study as well as 700 women without breast cancer.

SRI Initiative 4: Toward the Development of a California Chemicals Policy that Considers Breast Cancer

A major challenge to investigating the relationship between chemical exposure and breast cancer is a lack of toxicity information for tens of thousands of commonly used chemicals. To address this gap, CBCRP funded **Megan Schwarman** at the **UC Berkeley Center for Occupational and Environmental Health** and **Sarah Janssen** at **Natural Resources Defense Council** for \$234,739 to lead the Breast Cancer and Chemicals Policy Project. Investigators convened a panel of 20 scientists and policy experts to review the biological mechanisms associated with breast cancer and propose a strategy for screening and identifying chemicals that could increase the risk of the disease. The panel followed a unique “disease end point” model, which works backward from a disease to identify the changes caused by chemicals that could serve as early indicators of toxicity. This was the first time this approach had been used for any disease. In the absence of full understanding of the health impacts of all the chemicals people may be exposed to, it also suggested screening for categories of chemicals, such as endocrine disruptors, which are chemicals that can interfere with the hormonal balance in the body and can lead to developmental effects and cancer progression.

The process led to the publication of *Pathways to Breast Cancer: A Case Study for Innovation in Chemical Safety Evaluation*, a report documenting the outcomes. Findings were published in *Environmental Health Perspectives* in June 2015 and *Reproductive Toxicology* in July 2015.

SRI Initiative 5: Making Chemicals Testing Relevant to Breast Cancer

Lack of data on toxicity makes the task of evaluating the impacts of exposure to many chemicals on breast cancer risk unachievable. There is a critical need for a toxicity testing strategy for breast cancer that would identify biological mechanisms in breast cancer and development of new tests to screen for activity in these mechanisms. This initiative funded five studies for a total of \$4,909,249 to develop new methods and models for identifying and testing chemicals for their potential to contribute to breast cancer. These projects specifically focused on developing a battery of assays for screening chemicals that incorporates the spectrum of mechanisms (tumor promotion, tumor initiation, tumor enabling and developmental disruption) by which chemicals are known or suspected to contribute to breast cancer. Research outcomes include:

- Through this initiative **City of Hope** developed a screening test that can analyze 16 times as many chemicals as conventional means. The test—called AroER tri-screen™—can quickly analyze up to 1,536 compounds' effect on estrogen and aromatase, an enzyme that converts androgen to estrogen. The research team, led by **Shiuan Chen**, discovered that the antidepressant paroxetine (Paxil) acts as an estrogen promoter. This is especially important because women are commonly prescribed anti-depressants when they have been diagnosed with breast cancer. Based on the excellent technical and biological performance characteristics of the AroER tri-screen assay, it has been selected for screening in the Tox21 10K compound library for identification of aromatase inhibitors-like EDCs. Findings were published in *Toxicological Sciences* in May 2014.
- Researchers at the **California Pacific Medical Center Research Institute (CMPC)**, led by **Shanaz Dairkee**, found that low doses of curcumin, the main ingredient in the spice turmeric, reverses many of the major changes caused by exposure to bisphenol-A, (BPA). BPA exposure has long been thought to be a risk factor for developing breast cancer and

other developmental changes, including fetal abnormalities and possibly male cancers such as prostate cancer. Researchers found that BPA exposure induces aberrant expression of multiple checkpoints that regulate cell survival, proliferation and apoptosis, and that such changes can be effectively ameliorated.

Other researchers at **CPMC**, led by **William Goodson**, also took noncancerous breast cells from high-risk patients, grew them in a laboratory and found that once the cells were exposed to BPA and methylparaben, they started behaving like cancer cells. The team also found that when tamoxifen, which is used to treat breast cancer, was introduced in the lab, the cells exposed to the two chemicals kept growing and did not die. Findings were published in *Carcinogenesis* in March 2013.

- Humans are exposed to a wide variety of structurally diverse chemicals, including environmental and food contaminants. Many chemicals are endocrine disruptors, producing adverse hormonal effects including increased development and progression of breast cancer. Most breast cancers are initially hormone-dependent and require estrogens for growth. Aromatase, the final enzyme in the synthesis of estrogen, is regulated in a complex manner in breast cancer by at least four different gene promoters. Little is known about the chemicals to which women are exposed that can affect the expression of aromatase and consequently estrogen production in breast tissue. **Michael Denison** of **UC Davis** developed cell-based screening bioassays to identify and characterize chemicals that increase the risk of development or progression of breast cancer via their effect on aromatase promoter-specific gene expression. His study may provide new insights into mechanisms by which contaminants and commercial chemicals can affect estrogen synthesis and estrogen related responses.
- **Zena Werb** of **UCSF** used mouse mammary tissue to develop improved models to evaluate the impact of environmental stressors on breast tissues and identify related biomarkers. She specifically investigated the role of environmental chemical stressors on the perturbation of normal mammary development in mammary cells and tissues in culture and in vivo. Her analysis showed that environmental chemicals altered the carbohydrate structures in the breast cells in culture. Findings were published in *Journal of Cell Science* in June 2012. She was funded to further develop her studies under CBCPI.
- **Chris Vulpe** of **UC Berkeley** worked to develop a chemical screening test that will improve the ability to screen large numbers of chemicals as well as chemical mixtures, such as those in consumer products, house dust, drinking water, and air. The team worked closely with scientists at the US Environmental Protection Agency to coordinate the tools developed through the CBCRP-funded project with the federal programs for testing chemicals. The new screening tools could inform the design of safer chemicals (green chemistry), enable manufacturers to select better materials, help regulatory agencies identify chemicals of concern, and contribute to the understanding of environmental factors that contribute to breast cancer risk.

Developing new ways of testing chemicals that are relevant to breast cancer risk continues to be a priority. Additional funds were committed for future research in this area through CBCPI.

SRI Initiative 6: Statistical Methods to Study Interacting Factors that Impact Breast Cancer

Three studies were funded to explore what statistical methods can best take into account the complexity of breast cancer risk, including the likelihood that the effects of risk factors vary in combination with each other and over the life course for a total of \$1,037,347. Highlights of projects include:

- **Model-building with Complex Environmental Exposures**
David Nelson of **Cancer Prevention Institute of California** sought to build a model that would allow increasingly large and complex sets of data to be analyzed for the link between environmental exposures and breast cancer risk. He investigated links between hazardous air pollutants and increased breast cancer risk in California teachers. Researchers were able to conduct the first study to quantitatively examine the relationship between ambient residential exposures to select hazardous air pollutants and risk of breast cancer incidence among women using individual-level data. Additionally, important challenges were identified in working with complex data sets. Findings were published in *Environmental Health* on January 2015.
- **New Methods for Genomic Studies in African American Women**
Daniel Stram of **University of Southern California** used genome-wide association scans to explore the possibility that African American women may have unique genetic variants that contribute to susceptibility to breast cancer than do women of European descent. A specific trio of gene variants was found to be more predictive for African American women. In addition, novel risk variant genes were discovered in three places in the genome. Findings were published in *PLOS Genetics* in March 2013, *Human Genetics* in January 2013 and *PLOS One* in February 2013.
- **California Breast Cancer Mapping Project (CBCMP)**
Traditional breast cancer surveillance relies on aggregate county-level data. However, important information can be lost when using these artificial boundaries. CBCMP, led by **Eric Roberts** of the **Public Health Institute** developed and implemented a protocol to map breast cancer rates within and across county boundaries by looking at data obtained from the California Cancer Registry by census tract. This new approach to mapping helped pinpoint four previously unidentified areas of California that have invasive breast cancer rates substantially higher than the state average: sections of Ventura, Los Angeles, Riverside and Orange counties, as well as parts of the north and south Bay Area. This level of specificity will allow for more targeted research and more effective interventions. Findings were published in *Journal of Public Health Management and Practice* in May–June 2013.

SRI Initiative 7: Toward an Ecological Model of Breast Cancer Causation and Prevention

In the quest to identify the cause of breast cancer, scientists often investigate one factor at a time—but it's becoming increasingly clear that many factors interact with one another to contribute to the disease. It can be hard for decision makers, scientists and the public to sort through the research to fully understand the causal context of breast cancer. CBCRP invested \$258,963 to develop a new model for understanding breast cancer causation. Through the [New Paradigm of Breast Cancer Causation and Prevention](#) research initiative, **Robert Hiatt** at **UCSF** led a team in the creation of a breast cancer causation model that reflects the complexity of these interactions. The model was developed through a collaboration of scientists who synthesized evidence from scientific literature to offer their expert understanding of the relationships important to new cases

of post-menopausal breast cancer causation. This model is interactive (<http://www.cbcrp.org/research-topics/causal-model.html>), allowing decision makers, researchers and members of the public to explore connections and develop a conceptual framework for research. The project has proved successful and compelling enough that a second phase of research was funded through CBCPI. Findings were published in *Cancer Epidemiology, Biomarkers and Prevention* in October 2014.

SRI Initiative 8: Environmental Causes of Breast Cancer Across Generations

The *Three Generations Study* leverages a large study of families whose mothers enrolled in the Child Health and Development Studies when they were pregnant between 1959 and 1967. The study looks at causes of breast cancer and other diseases affecting women that may pass from one generation to the next or be caused by things in the environment. CBCRP invested \$4,975,867 to fund **Barbara Cohn** and her team at the **Public Health Institute** to test the idea that prenatal exposure to environmental chemicals increases the risk of breast cancer. Cohn assessed data from 9,300 women whose mothers had been tracked in the initial study and identified 118 women (now adults) diagnosed with breast cancer. For the first time researchers were able to show that women who had been exposed to significant levels of DDT in their mother's womb were four times as likely to develop breast cancer as their counterparts who had been exposed to only a small quantity of the pesticide. Findings were published in the *Journal of Clinical Endocrinology and Metabolism* in August 2015.

Due to the significance of this study's findings, results have been widely publicized, with articles in *Time*, *U.S. News and World Report*, *The San Francisco Chronicle*, *NBC Nightly News*, *WNYC New York Public Radio*, a two-part article in *Environmental Health News*, *ASCO (American Society of Clinical Oncology) Post*, and *Chicago Tribune*.

SRI Initiative 9: Environmental Exposures & Breast Cancer in a Large, Diverse Cohort

The California Teachers Study (CTS), started in 1995, is a large ongoing study of breast cancer among 133,479 female California professional school employees. The CTS cohort was established by investigators interested in links between environmental exposures, genetics, nutrition and breast cancer. This SRI initiative saw the potential of using a large, existing California-based cohort such as CTS to investigate key environmental exposures that could increase risk for breast cancer. CBCRP funded **Peggy Reynolds** of the **Cancer Prevention Institute of California** for \$4,863,028 to use data that had already been collected through the CTS to investigate the risk of breast cancer associated with both older and newer persistent organic pollutants of human health concern, including DDT, polychlorinated biphenyls, polybrominated diphenyl ethers and other brominated flame retardants. She is also looking for disparities in, and predictors of, body burden levels of these compounds and is exploring potentially important windows of susceptibility—times in a woman's life when exposure may have different impacts. Results from this project were published in *Environmental Health Perspectives* June 2015.

Table 11: Program-initiated Awards with Funding that Concluded in 2010–2015

Initiative	Year Funded	Title	Investigator(s)	Institution(s)	Dollars
SRI Initiative 1: Understanding Racial and Ethnic Differences in Stage-Specific Breast Cancer Survival – pilot study	2009	Race & Ethnicity in Stage-specific Breast Cancer Survival	Wu, Anna	University of Southern California	\$166,003
SRI Initiative 1: Understanding Racial and Ethnic Differences in Stage-Specific Breast Cancer Survival	2010	California Breast Cancer Survivorship Consortium – CPIC	Gomez, Scarlett	Cancer Prevention Institute of California	\$677,000
		California Breast Cancer Survivorship Consortium – COH	Bernstein, Leslie	Beckman Research Institute of the City of Hope	\$435,775
		California Breast Cancer Survivorship Consortium – KaiserDOR	Kwan, Marilyn	Kaiser Foundation Research Institute	\$392,441
		California Breast Cancer Survivorship Consortium – USC MEC	Monroe, Kristine	University of Southern California	\$216,332
SRI Initiative 2: Demographic Questions for California Breast Cancer Research	2009	Demographic Questions for California BC Research	Gomez, Scarlett	Cancer Prevention Institute of California	\$430,588
SRI Initiative 4: Toward the Development of a California Chemicals Policy that Considers Breast Cancer	2009	Breast Cancer & Chemicals Policy	Schwarzman, Megan Balmes, John	UC Berkeley	\$234,739
SRI Initiative 5: Making Chemicals Testing Relevant to Breast Cancer	2011	Biologically Relevant Screening of Endocrine Disruptors	Chen, Shiuan	Beckman Research Institute of the City of Hope	\$1,512,000
		Cell Bioassays for Detection of Aromatase Gene Activators	Denison, Michael	UC Davis	\$421,680
		Biomarkers for Environmental Exposures in Breast Cancer	Werb, Zena	UCSF	\$900,000
		Building on National Initiatives for New Chemicals Screening	Vulpe, Chris	UC Berkeley	\$1,175,569

Initiative	Year Funded	Title	Investigator(s)	Institution(s)	Dollars
SRI Initiative 6: Statistical Methods to Study Interacting Factors that Impact Breast Cancer	2009	Model-building with Complex Environmental Exposures	Nelson, David	Cancer Prevention Institute of California	\$280,753
		New Methods for Genomic Studies in African American Women	Stram, Daniel	University of Southern California	\$411,297
		Cancer Mapping: Making Spatial Models Work for Communities	Roberts, Eric	Public Health Institute	\$345,297
SRI Initiative 7: Toward An Ecological Model of Breast Cancer Causation and Prevention	2009	New Paradigm of Breast Cancer Causation and Prevention	Hiatt, Robert	UCSF	\$258,963
SRI Initiative 9: Environmental Exposures & Breast Cancer in a Large, Diverse Cohort –Pilot	2009	Exploring Disparities, Environmental Risk Factors in Teachers	Hurley, Susan Reynolds, Peggy	Cancer Prevention Institute of California	\$130,837

Table 12: Program-initiated Awards with Funding in Progress 2010–2015

Initiative	Fund Year	Title	Investigator(s)	Institution(s)	Dollars
SRI Initiative 1: Understanding Racial and Ethnic Differences in Stage-Specific Breast Cancer Survival	2010	California Breast Cancer Survivorship Consortium - USC AABCS	Wu, Anna	University of Southern California	\$1,007,117
SRI Initiative 3: Piloting an Integrated Approach to Understanding Behavioral, Social and Physical Environment Factors and Breast Cancer among Immigrants	2011	Immigrant Experience & Breast Cancer Risk in Asians	Gomez, Scarlett	Cancer Prevention Institute of California	\$722,098
SRI Initiative 5: Making Chemicals Testing Relevant to Breast Cancer	2011	Xenoestrogen-specific perturbations in the human breast	Dairkee, Shanaz	California Pacific Medical Center Research Institute	\$900,000

Initiative	Fund Year	Title	Investigator(s)	Institution(s)	Dollars
SRI Initiative 8: Environmental Causes of Breast Cancer Across Generations	2009	Environmental Causes of Breast Cancer across Generations	Cohn, Barbara	Public Health Institute	\$4,975,867
SRI Initiative 9: Environmental Exposures & Breast Cancer in a Large, Diverse Cohort	2010	Persistent Organic Pollutants & Breast Cancer Risk	Reynolds, Peggy	Cancer Prevention Institute of California	\$4,850,028
CBCPI RFQ	2010	Partnership to Advance Breast Cancer Research	Woodruff, Tracey	UCSF	\$1,406,639
CBCPI 3: Women Firefighters Biomonitoring Collaborative Study	2013	Women Firefighters Biomonitoring Collaborative	Morello-Frosch, Rachel	UC Berkeley	\$833,945
			Buren, Heather	United Fire Service Women	
			Stefani, Tony	SF Fire Department	
CBCPI 6: Paradigm Model for Breast Cancer: Follow On	2014	New Paradigm Model for Breast Cancer: Phase II	Hiatt, Robert	UCSF	\$859,431
CBCPI 5: Chemical Safety Testing to Reduce Breast Cancer Risk	2015	Chemical Testing to Prevent Cancer: Research Translation	Schwarzman, Megan	UC Berkeley	\$217,691
			Cohn, Barbara	Public Health Institute	\$1,212,557
			Yaswen, Paul	Lawrence Berkeley National Laboratory	\$1,657,913
			Smith, Martyn	UC Berkeley	\$1,038,676
			Werb, Zena	UCSF	\$1,125,000

B. Funding and Research Details: The Community Impact of Breast Cancer

California's great strength comes from the diversity of the people who live here. Yet there are clear discrepancies in who has access to resources. When it comes to breast cancer, there is not a universal cause and effect. Differences in ethnicity, culture, language, sexual orientation,

immigration history, and socioeconomic status all contribute to disparities in prevention, detection, treatment and care of people with the disease.

CBCRP encourages research that addresses disparities and the burden of breast cancer among California's diverse communities. CBCRP seeks to address these disparities by investing in research that answers critical questions, such as:

- How do poverty, race/ethnicity, and social factors impact incidence and mortality for breast cancer?
- What are the sociocultural, behavioral, and psychological issues faced by women at risk for or diagnosed with breast cancer?
- What services are needed to improve access to care in order to improve quality of life and reduce suffering?
- What policies can help reduce disparities related to prevention, detection and treatment of breast cancer?

This section highlights the research that focuses specifically on the community impact of breast cancer. Over the past five years, we have made significant investments that have led to innovations in health literacy, especially for underserved communities; the specific needs of Latinas in accessing screening, education, care and support related to breast cancer; the specific needs of young women diagnosed with breast cancer; and ways to make more effective policy decisions around breast cancer.

CBCRP invested over \$15.3 million dollars in 34 investigator-initiated community impact research projects that were conducted between 2010 and 2015. Below are highlights of a selection of research projects CBCRP has funded, followed by Table 13 and 14, which highlight research that was concluded between 2010 and 2015 and in progress (respectively) for all research related to community impact of breast cancer.

Highlights of Funding that Concluded between 2010–2015

Cost-effectiveness Analysis to Inform BC Screening Policy

Every Woman Counts (EWC), a California breast cancer screening program, faced challenging budget cutbacks and policy choices. Making effective policy choices can have significant impacts on how many women are served and how well they are served. Carefully constructed computer modeling can be useful in projecting potential outcomes of policy and budgetary choices. **Joy Melnikow** of **UC Davis** developed a computer interface to enable breast cancer policy makers, advocates, and researchers to choose program parameters and receive immediate feedback on the costs and outcomes of policy alternatives they are considering. This project is aimed at creating a user-friendly tool that will help to integrate research evidence into health policy making. Using this model, researchers were able to find that for the EWC program, biennial screening mammography starting at age 50 years was the most cost-effective strategy.

Building Mixtec Community Capacity to Address Breast Health

In recent decades, Mixtec people have emigrated from Oaxaca, one of the poorest areas of Mexico, to California, becoming one of the largest indigenous groups of farm workers in the state. Many are unable to read and write even at a basic level in any language and speak neither Spanish nor English, but only their native non-written Mixteco language. They face exploitation and discrimination in labor, housing and everyday life and most live in extreme poverty. Serving

the health needs of this community is complex due to a lack of health care providers who speak Mixteco, as well as cultural barriers and challenges in reaching out to the community. To address these gaps, **Sandra Young** of the **Mixteco/Indigena Community Organizing Project (MICOP)** and **Annette Maxwell** of the **UCLA Center for Cancer Prevention and Control Research** partnered to conduct one of the largest systematic efforts to survey the needs of any indigenous community undertaken by peers speaking the indigenous language. They trained 10 Mixtec-Spanish bilingual promotoras. During that training, MICOP staff and promotoras (lay people trained to assist Latinas/Hispanic with health education and guidance through the health care system) identified breast health as a community priority. These promotoras then conducted focus groups with Mixtec community members. Health concerns discussed in the focus groups include outdoor exercise among women being viewed as flirtatious; reluctance to ask for governmental assistance due to fear that children will have to pay it back later; soda consumption perceived as a symbol of socio-economic status; and unwillingness to obtain mammograms or pap smears because private body parts are to be touched by husbands only. This research suggests that training promotoras to conduct focus groups can increase organizational capacity to identify pressing health needs in under-represented and hard-to-reach population groups. Findings from this research have been published in *Journal of Immigrant and Minority Health* in April 2014.

Nuevo Amanecer: Promoting the Psychosocial Health of Latinas

Women with breast cancer often experience emotional distress including depression, anxiety, and relationship problems. Latina breast cancer patients may be more likely than White women to experience this distress. Psychosocial support services can greatly improve the quality of life for some women, yet Latina breast cancer patients infrequently use them. **Carmen Ortiz** of **Circulo de Vida Cancer Support and Resource Center** and **Anna Napoles** of **UCSF** have been working together for more than ten years to answer the questions of how to improve access and use of social support services for Latinas with breast cancer. Their first CBCRP CRC award in 2005 supported them in conducting telephone surveys with Spanish-speaking Latina cancer patients to understand why these services were not being used. They went on to conduct a randomized clinical trial of the *Nuevo Amanecer* program, a culturally tailored, peer-delivered cognitive-behavioral stress management intervention for low-income Spanish-speaking Latinas with breast cancer. They found that engaging community members in design and implementation of community-based programs and trials enhances cultural appropriateness and congruence with the community context. Findings were published in *Clinical Trials* in April 2014.

In 2015 the research team was funded for a Translational grant to make the program more accessible (e.g., different literacy levels) and available across California. They expanded their work together with a grant from CBCRP in 2013, called **Meeting the Self-care Needs of Latinas after Breast Cancer** where they focus on the lack of culturally and linguistically appropriate information on recommended health care and self-care following active cancer treatment (e.g., management of increased risks of subsequent cancer and treatment side effects) for Spanish-speaking Latina breast cancer survivors.

Intervening on Reproductive Health in Young BC Survivors

Ten percent of the 2.8 million breast cancer survivors in the U.S. were diagnosed when they were younger than 45 years old. Most young patients undergo chemotherapy and/or endocrine therapy, treatments that impair ovarian function and result in significant adverse reproductive health effects. These late effects include symptoms of estrogen deprivation such as hot flashes, fertility concerns, limited contraception options and sexual problems. Together they can have a major, negative impact on quality of life. Despite substantial research, treatment guidelines and clinical

expertise on these issues, most young breast cancer survivors and their healthcare providers have limited guidance on how best to manage these reproductive health late effects. To address this, **Irene Su** of **UC San Diego** is generating and testing the efficacy of the Reproductive Health Survivorship Care Plan (SCP-R), a novel survivorship care tool to meet the reproductive health needs of young breast cancer survivors (YBCS). The project will be the first to address a gap in research on translating knowledge on reproductive health into health services delivery to improve everyday outcomes in YBCS.

Table 13: The Community Impact of Breast Cancer Funding that Concluded in 2010–2015*

Award Type	Year Funded	Title	Investigator(s)	Institution(s)	Dollars
CRC Full Research Award	2006	Telephone-Based Decision Support for Rural Patients	Belkora, Jeffrey	UCSF	\$310,914
			O'Donnell, Sara	Mendocino Cancer Resource Center	\$361,358
CRC Full Research Award	2007	Expanding Rural Access: Distance Delivery of Support Groups	Koopman, Cheryl	Stanford University	\$290,337
			Ferrier, Susan Kreshka, Mary Anne	The Sierra Fund	\$197,283
CRC Full Research Award	2007	Underserved Women with Breast Cancer at End of Life	Adler, Shelley	UCSF	\$437,845
			Stone, Kendra Burns, Beverly Wells, Denise	Charlotte Maxwell Complementary Clinic	\$169,653
CRC Full Research Award	2008	Breast Cancer Clinical Trials Education Program	Malcarne, Vanessa	San Diego State University	\$206,027
			Riley, Natasha	Vista Community Clinic	\$360,112
			Sadler, Georgia	UC San Diego	\$158,140
CRC Full Research Award	2008	Increasing Mammography Screening in Latinas with Diabetes	Roussos, Stergios	San Diego State University Research Foundation	\$251,867
			Noguera, Christine	Golden Valley Health Centers	\$493,666
CRC Full Research Award	2009	Nuevo Amanecer: Promoting the Psychosocial Health of Latinas	Ortiz, Carmen	Circulo de Vida Cancer Support and Resource Center	\$313,067
			Napoles, Anna	UCSF	\$349,547
CRC Full Research Award	2010	Recording Medical Visits for People with Breast Cancer	Belkora, Jeffrey	UCSF	\$637,500
			O'Donnell, Sara	Mendocino Cancer Resource Center	
CRC Pilot Award	2011	At-Home Group Video Calling to Support Rural Women	Hild, Joanne Kreshka, Mary Anne	Sierra Streams Institute	\$112,500
			Koopman, Cheryl	Stanford University	\$93,960.51
CRC Pilot Award	2011	Clinical Trials Education and Access for Underserved Women	Caprio, Maria	SHANTI	\$93,906
			Joseph, Galen	UCSF	\$74,875

Award Type	Year Funded	Title	Investigator(s)	Institution(s)	Dollars
CRC Pilot Award	2012	Building Mixtec Community Capacity to Address Breast Health	Maxwell, Annette	UCLA	\$168,750
			Young, Sandra	Mixteco/Indigena Community Organizing Project	
CRC Pilot Award	2012	E-messaging for Abnormal Mammogram Follow-up in Latinas	Londono, Carlos Del Rio, Claudia	Tiburcio Vasquez Health Center, Inc.	\$203,730
			Oakley-Girvan, Ingrid	Cancer Prevention Institute of California	
CRC Pilot Award	2012	Latina Breast Cancer Health Literacy Pilot Project	Brongiel, Ilana	Centro de Salud de la Comunidad de San Ysidro, Inc.	\$210,071
			Castaneda, Sheila	San Diego State University Research Foundation	
CRC Conference Award	2014	QuickStart: Training in CBPR in BC, Enviro, and Disparities	Sarantis, Heather	Commonweal	\$150,418
Dissertation Award	2009	Health Anxiety as a Risk for Insomnia in Breast Cancer	Rissling, Michelle	UC San Diego	\$72,976
IDEA	2008	Quality of Mammography Facilities Serving Vulnerable Women	Goldman, L. Elizabeth	UCSF	\$150,000
IDEA	2009	Health Literacy in Older Patient's Breast Cancer Treatment	Naeim, Arash	UCLA	\$180,890
IDEA	2009	Patient and Clinician Knowledge of Breast Cancer Lymphedema	Kwan, Marilyn	Kaiser Foundation Research Institute	\$227,784
IDEA	2011	Cost-effectiveness Analysis to Inform BC Screening Policy	Melnikow, Joy	UC Davis	\$149,996
IDEA Competitive Renewal	2008	Neighborhoods and Obesity in Pre-adolescent Girls: Part II	Yen, Irene	UCSF	\$214,406
IDEA Competitive Renewal	2010	Quality of Mammography Facilities Serving Vulnerable Women	Goldman, L. Elizabeth	UCSF	\$238,230
Joining Forces Conference Award	2012	3rd Biannual National Latino Cancer Summit	Gonzalez, Christina	Latinas Contra Cancer	\$25,000
Joining Forces Conference Award	2012	Increasing California's Capacity to Partner in Global Breast	Ashing-Giwa, Kimlin	Beckman Research Institute of the City of Hope	\$25,000

Award Type	Year Funded	Title	Investigator(s)	Institution(s)	Dollars
Joining Forces Conference Award	2013	Sustainable Education to Eliminate Disparities (SEED)	Rhoads, Kim	Stanford University	\$24,975
Postdoctoral Fellowship	2009	Macrophages in Breast Cancer Patients of African Descent	Mukhtar, Rita	UCSF	\$89,518
Postdoctoral Fellowship	2009	Risk Factors and Breast Cancer Survival in Black/White Women	Lu, Yani	Beckman Research Institute of the City of Hope	\$89,996

* Grant titles in this table may appear to repeat due either phased research (a pilot grant followed by a full research grant) or due to continuation grants being given.

Table 14: The Community Impact of Breast Cancer Funding in Progress as of 2015

Award Type	Year Funded	Title	Investigator(s)	Institution(s)	Dollars
CRC Full Research Award	2011	Sister Survivor: Improving Access to Survivorship Care Plan	Britton, Florence Pickens Isis Tapp, Carolyn	Women of Color	\$93,750
			Ashing-Giwa, Kimlin	Beckman Research Institute of the City of Hope	\$858,880
CRC Full Research Award	2013	Reporting Personal Levels of Environmental Chemicals: Impact	Cohn, Barbara Havas, Laurie	Public Health Institute	\$756,093
CRC Full Research Award	2014	Engaging Underserved Women in Health Research	Joseph, Galen	UCSF	\$375,000
			Nickell, Alyssa	SHANTI	
CRC Pilot Award	2013	Latinas' Experiences of Breast Cancer Treatment	Gomez, Carla Halley, Meghan	Palo Alto Medical Foundation Research Institute	\$212,648
CRC Pilot Award	2013	Meeting the Self-care Needs of Latinas after Breast Cancer	Napoles, Anna	UCSF	\$191,431
			Ortiz, Carmen	Circulo de Vida Cancer Support and Resource Center	
CRC Pilot Award	2014	API-friendly Resources for BC Clinical Trials	Sadler, Georgia	UC San Diego	\$43,750
			Malcarne, Vanessa	San Diego State University Research Foundation	\$52,325
			Seligman, Fe	Operation Samahan Inc.	\$100,000
CRC Pilot Award	2014	Exploring Rural Disparities in Breast Cancer Mortality	Elvine-Kreis, Brenda Uyeki, Terry	Humboldt Community Breast Health Project	\$217,102
IDEA	2013	Breast Cancer and Neurocognitive Outcomes	Patel, Sunita	Beckman Research Institute of the City of Hope	\$267,423

Award Type	Year Funded	Title	Investigator(s)	Institution(s)	Dollars
Translational Research Award	2014	Intervening on Reproductive Health in Young BC Survivors	Su, Irene	UC San Diego	\$968,782

C. Funding and Research Details: Etiology and Prevention

Although our foundation of knowledge for the basic science aspects of breast cancer (tumor biology) has expanded greatly over the past decades, there still remains a gap in our strategies for large-scale prevention due to uncertainties over the underlying causes of the disease and their relative importance. There is an extensive list of factors associated with increased or decreased risk for breast cancer. However, critical questions remain: What environmental and biological factors interact to increase the risk of developing breast cancer? What role does someone’s neighborhood, occupation or immigrant status play in breast cancer risk? What approaches can be used to reduce or eliminate breast cancer risk?

CBCRP especially encourages new California-based studies that seek an understanding of the environmental and lifestyle causes of breast cancer, and how these factors increase risk and impact different California communities. Specific topics for research in this area might include:

- Etiology: What is the role of the environment and lifestyle in breast cancer risk?
- Prevention and Risk Reduction: How can we end the danger of breast cancer?

The past five years have offered several significant advances in these research areas. CBCRP has funded research into the effect of exposure to light at night, occupational risks such as working in nail salons or in agriculture, the role of Vitamin D in breast cancer survival, and other areas.

CBCRP invested over \$8.3 million dollars in 25 investigator initiated etiology and prevention research projects that were conducted between 2010 and 2015. Below are highlights of a selection of research projects CBCRP has funded. Tables 15 and 16 highlight research that was concluded between 2010 and 2015 and in progress (respectively) for all research related to etiology and prevention.

Highlights of Funding Concluded in 2010-2015

Light at Night and Breast Cancer Risk Among California Teachers

There has been convincing evidence that exposure to light at night promotes mammary (breast) cancer in rodents for some time, however the role that light at night (LAN) plays in increasing human breast cancer risk has been less understood. **Peggy Reynolds** at **Cancer Prevention Institute of California** analyzed data from the California Teachers Study participants to determine that women living in areas with very high levels of outdoor LAN had about a 10 percent increased risk of breast cancer compared to women who lived in areas with the lowest levels of indoor LAN. Findings like these can have significant implications for people who work night shifts or who live in urban areas. Findings were published in *Epidemiology* in September 2014.

Migration and Breast Cancer Risk in Hispanics

Elad Ziv of **UCSF** identified a gene variant that derived from indigenous American ancestry that may protect women of Latin American descent from breast cancer. This may explain the lower

incidence of breast cancer observed in Latinas compared to other racial or ethnic groups. The gene variant, which is called a single-nucleotide polymorphism (SNP), gives Latinas protection from more aggressive estrogen receptor-negative types of breast cancer—the kinds that are linked to poor long-term survival. Inheriting this variant may reduce the risk of breast cancer in Latinas by 40–80 percent. Findings were published in *Nature Communications* in October 2014.

Breast Cancer Risks in California Nail Salon Workers

CBCRP is committed to supporting research to understand how occupational exposures may increase risk for breast cancer and other health problems. Beginning in 2005, CBCRP began funding research focused on health risks for nail salon workers. In the San Francisco Bay Area many of the nail salon workers are Vietnamese. Researchers at the **Cancer Prevention Institute of California** partnered with **Linda Okahara** of **Asian Health Services** to understand what chemicals these nail salon workers are exposed to and how this may affect them. While an increased risk for breast cancer was not identified for the population studied compared to the general Vietnamese female population, other risks were identified. Workers wore air monitoring devices that detected high levels of toluene, methyl methacrylate and total volatile organic compounds at levels higher than recommended guidelines to prevent health symptoms like headaches, irritations, and breathing problems. Findings were published in *American Journal of Public Health* in December 2011. Through these efforts, a strong and lasting community/scientist partnership has been built. These partnerships have helped salon owners address these exposures and informed public policy in California and nationally. The research partners have also secured multiple NIH grants based on this work and continue to work together to promote worker health and safety.

Table 15: Etiology and Prevention Funding that Concluded in 2010–2015

Award Type	Year Funded	Title	Investigator(s)	Institution(s)	Dollars
CRC Full Research Award	2007	Breast Cancer Risks in California Nail Salon Workers	Reynolds, Peggy	Cancer Prevention Institute of California	\$348,319
			Okahara, Linda	Asian Health Services	\$315,778
Dissertation Award	2008	Prognostic Implications of DNA Glycation in Breast Cancer	Tamae, Daniel	Beckman Research Institute of the City of Hope	\$67,060
IDEA	2008	Pesticide and Gene Interactions in Latina Farm Workers	Mills, Paul	UCSF	\$160,718
IDEA	2008	Antidepressants and Breast Cancer Treatment Interactions	Haque, Reina	Kaiser Foundation Research Institute	\$156,068
IDEA	2010	Vitamin D and Breast Cancer Survival	John, Esther Wei, Wang	Cancer Prevention Institute of California	\$220,132
IDEA	2010	Light at Night and Breast Cancer Risk in California Teachers	Reynolds, Peggy	Cancer Prevention Institute of California	\$197,333
IDEA	2011	Epigenetic Changes as Modifiers of BRCA1/ BRCA2 Cancer Risk	Neuhausen, Susan	Beckman Research Institute of the City of Hope	\$251,128
IDEA	2011	Cadmium, Age at Menarche, and Early Puberty in Girls	Horn-Ross, Pamela Rull, Rudolph	Cancer Prevention Institute of California	\$204,553

Award Type	Year Funded	Title	Investigator(s)	Institution(s)	Dollars
IDEA	2011	Soy, DNA Methylation and Breast Cancer	Wu, Anna	University of Southern California	\$244,524
IDEA	18IB-0008	Maternal Folic Acid Intake, Mammary Development, and Cancer	Miller, Joshua, Hovey, Russell	UC Davis	\$149,944
Joining Forces Conference Award	2011	5th International Workshop on Breast Cancer Risk Assessment	Shepherd, John	UCSF	\$20,000
Joining Forces Conference Award	2013	6th International Workshop on Breast Cancer Risk Assessment	Shepherd, John	UCSF	\$25,000
Joining Forces Conference Award	2015	GIS for Community Impact: From Technology to Translation	Barlow, Janice	Zero Breast Cancer	\$24,299
Postdoctoral Fellowship	2008	Genes in Hormone Metabolism Pathway and Breast Cancer	Lee, Eunjung	University of Southern California	\$134,996
Translational Research Award	2009	Breast Cancer Risk Reduction: A Patient-Doctor Intervention	Kaplan, Celia	UCSF	\$740,685
Translational Research Award	2009	Soy Treatment for High-risk Women and DCIS Patients	Wu, Anna	University of Southern California	\$1,203,784

Table 16: Etiology and Prevention Funding in Progress as of 2015

Award Type	Year Funded	Title	Investigator(s)	Institution(s)	Dollars
CRC Full Research Award	2012	HERMOSA: Hlth & Enviro Res on Make-up of Salinas Adolescents	Harley, Kim	UC Berkeley	\$687,585
			Parra, Kimberly	Clinica de Salud del Valle de Salinas	
CRC Pilot Award	2013	Is Cost of Beauty Putting Black Women at Risk? IEAAWC Study	Montgomery, Susanne	Loma Linda University	\$136,924
			Mitchell, Eudora	Quinn Community Outreach Corporation	\$62,500
			Clark, Phyllis	Healthy Heritage Wellness	\$19,076

Award Type	Year Funded	Title	Investigator(s)	Institution(s)	Dollars
CRC Pilot Award	2013	Using CBPR to Promote Environmental Justice in Wilmington, CA	Maxwell, Annette	UCLA	\$93,750
			Marquez, Jesse	Coalition for a Safe Environment	\$93,750
CRC Pilot Award	2013	Cadmium and Arsenic Exposure in a Mining Impacted Community	Hild, Joanne Sellen, Jane	Sierra Streams Institute	\$202,989
			Reynolds, Peggy	Cancer Prevention Institute of California	
IDEA	2012	Predicting BRCA1 Mutation Status from Tumor Pathology	Hamilton, Ann	University of Southern California	\$246,000
IDEA	2013	Getting a Jump on Cancer with a Genomic Risk Classifier	West, Robert	Stanford University	\$260,110
IDEA	2013	Internal Chemical Exposure Study among Mexican Immigrants	Fejerman, Laura	UCSF	\$124,996
IDEA	2014	Breast Cancer and the Human Oral Microbiome	Campbell, Michael	UCSF	\$187,264
IDEA	2014	Persistent Organic Pollutants and Mammographic Density	Lee, Eunjung	University of Southern California	\$248,244

D. Funding and Research Details: Detection, Prognosis and Treatment

Until we learn how to prevent all breast cancers, research on detection, prognosis and treatment is critical. Topics funded by CBCRP in these areas continue to change as novel technologies and approaches come under investigation—breast cancer detection technology is moving past traditional mammography; diagnosis is depending on understanding the genetic profile of tumors rather than the anatomy; and treatment is moving toward more tailored and personalized approaches.

The past five years of CBCRP-funded research has yielded promising results. Below are highlights from studies that have uncovered that cancer stem cells may become resistant to radiation treatment, that the “welllderly”—people over 80 who are healthy—may be able to teach us something about antibodies that fight cancer, and that a simple saliva test for breast cancer may be on the horizon. Findings such as these may provide doctors and patients tools to address breast cancer that are less invasive and more effective. Importantly, they may also greatly reduce the need for unnecessary interventions.

Two research topics are represented in this section:

- Imaging, Biomarkers, and Molecular Pathology: Improving Detection and Diagnosis
- Innovative Treatment Modalities: Search for a Cure

CBCRP invested over \$18.7 million dollars in 66 investigator initiated detection, prognosis and treatment research projects that were conducted between 2010 and 2015. Below are highlights of selected research projects CBCRP has funded. Tables 17 and 18 list research that was concluded between 2010 and 2015 and in progress (respectively) for all research related to detection, prognosis and treatment.

Highlights of Funding Concluded in 2010–2015

Modulation of Breast Cancer Stem Cell Response to Radiation

The relationship between breast cancer and radiation is complex. It has long been understood that radiation treatment carries health risks, but researchers are now finding that it may actually create treatment-resistant breast cancer cells. **Frank Pajonk** of **UCLA** looked into the properties of breast cancer stem cells (which contribute to breast cancer recurrence) to see how they respond to ionizing radiation. He found that ionizing radiation treatment kills about half of all malignant cells during each treatment; however, the remaining cancer cells can become treatment resistant. Thus, developing treatment-resistant cells can offset otherwise highly effective radiation treatment. The potential to understand how to modify this effect may lead to options that reduce radiation exposure and improve treatment outcomes. Findings from this study have been published in *Breast Cancer Research* in February 2010, *Stem Cells* in April 2010, *Stem Cells* in May 2012 and *PLOS One* in March 2012.

Combating Breast Cancer with the Welllderly Immune Repertoire

What can healthy, older adults teach us about breast cancer? **Brunhilde Felding** of **Scripps Research Institute** took a unique approach to explore this question by examining blood samples of the ““welllderly””—healthy adults over 80—to understand the reasons for their long life. By studying antibodies, she was able to identify footprints, or memories, of past victories against cancer, specifically triple negative breast cancer, which currently lacks effective treatment options. Understanding how the welllderly have naturally fought off the disease provides important opportunities to develop effective treatment therapies for this aggressive form of breast cancer. Findings have been published in *Nature Reviews Cancer* in February 2011, *Journal of Molecular Biology* in March 2011, *Journal of Neurooncology* in September 2011, *Chemistry and Biology* in March 2011, *Bioconjugate Chemistry* in August 2011, *Cancer Cell* in November 2011, *Proceedings of the National Academy of Sciences if the United States of America* in October 2012 and *Journal of Clinical Investigation* in March 2013.

Stratifying DCIS Biopsies for Risk of Future Tumor Formation

Thea Tlsty and her team at **UCSF** have discovered a way to predict whether women with ductal carcinoma in situ (DCIS) —the most common form of non-invasive breast cancer—are at risk for developing more invasive tumors in later years. Historically, women diagnosed with DCIS have often pursued aggressive treatments such as chemotherapy, radiation or mastectomy, though it is becoming increasingly clear that this may not be necessary for everyone. Not all cases of DCIS develop into life-threatening breast cancer. However, without a reliable screen for what risk each person’s DCIS poses, doctors and patients have often opted for interventions. It is hoped that these findings will give women with DCIS the opportunity to be more selective about their treatment. Findings were published in the *Journal of the National Cancer Institute* in May 2010, *Cancer Prevention Research* in May 2010, *Cancer Prevention Research* in February 2010 and *Breast Cancer Research* in December 2009.

Measuring Real-World Breast Cancer Outcomes

Emerging interventions are improving breast cancer survival; however, we still know very little about their impact on the "real world" of breast cancer care. Alison Kurian of Stanford University Cancer Institute in partnership with Palo Alto Medical Foundation built a highly innovative data resource using the electronic health records from both institutions. This project resulted in a uniquely informative multidisciplinary research tool, Oncoshare, which contains de-identified data from about 15,000 California breast cancer patients diagnosed since 2000. Investigators from multiple institutions are using it to understand, and ultimately to improve, real-world breast cancer care. Findings were published in *Journal of the American Medical Informatics Association* in June 2012 and *Cancer* in January 2014.

Salivary Biomarkers for Early Detection of Breast Cancer

Diagnosing breast cancer can be invasive and costly, however, UCLA researcher Lei Zhang’s investigation points to a potential breakthrough using a simple saliva test. He hypothesized that a primary tumor stimulates changes in DNA and RNA throughout the body. With the CBCRP funding, he validated markers that the team suspected indicated the presence of a tumor and found seven more. Based on this, he is developing tests that detect changes in saliva cells that indicate the presence of breast cancer. If successful, this research will lead to possibly the least invasive way to diagnose breast cancer. In principle, this test could be developed not just for breast cancer screening but also for monitoring an individual’s response to different therapeutic options, offering hope for truly personalized cancer diagnostics. Findings were published in *PLOS One* in December 2010 and updated in the *National Center for Biotechnology Information gene expression omnibus* in 2015.

Table 17: Detection, Prognosis and Treatment Funding that Concluded in 2010–2015*

Award Type	Year Funded	Title	Investigator(s)	Institution(s)	Dollars
CRC Full Research Award	2010	Increasing Mammography Screening Among Native Women	Navarro, Linda	Turtle Health Foundation	\$519,269
			von Friederichs-Fitzwater, Marlene	UC Davis	
Dissertation Award	2009	Diffusion-weighted MRI in Monitoring Breast Cancer Treatment	Singer, Lisa	UCSF	\$48,115
Dissertation Award	2009	Sound Speed Tomography for Early Breast Cancer Detection	Nebeker, Jakob	UC San Diego	\$74,325
Dissertation Award	2009	A Predictive Factor for Eribulin Treatment of Breast Cancer	Smith, Jennifer	UC Santa Barbara	\$74,988
Dissertation Award	2010	Targeting Breast Tumor Stem Cells with Cell Cycle Inhibitors	Huskey Mullin, Noelle	UCSF	\$75,981
Dissertation Award	2010	MRI Registration for Therapy Evaluation and Annual Screening	Lin, Muqing	UC Irvine	\$76,000
Dissertation Award	2010	Electronics for High Resolution Breast-Dedicated PET	Lau, Frances	Stanford University	\$75,924

Award Type	Year Funded	Title	Investigator(s)	Institution(s)	Dollars
Dissertation Award	2010	A Novel Mediator of AI Resistance in Breast Cancer	Petrossian, Karineh	Beckman Research Institute of the City of Hope	\$76,000
IDEA	2009	Antibody-based Targeting of Breast Cancer Stem Cells	Gottstein, Claudia	UC Santa Barbara	\$150,000
IDEA	2009	Combating Breast Cancer with the Wellderly Immune Repertoire	Felding, Brunhilde	Scripps Research Institute	\$284,718
IDEA	2009	Targeting DNA Repair Function of Breast Cancer Stem Cells	Wu, Xiaohua	Scripps Research Institute	\$284,660
IDEA	2009	Membrane-associated Estrogen Receptors in Breast Cancer	Pietras, Richard	UCLA	\$149,119
IDEA	2009	Metabolite Imaging to Identify Drug Resistant Breast Cancer	Northen, Trent	Lawrence Berkeley National Laboratory	\$171,892
IDEA	2009	Reducing Surgical Morbidity of Breast Cancer Staging	Chen, Steven	UC Davis	\$149,983
IDEA	2009	Inhibitors of Condensin I as Chemotherapy for Breast Cancer	Yokomori, Kyoko	UC Irvine	\$100,000
IDEA	2009	Survival in de novo and Recurrent Metastatic Breast Cancer	Pal, Sumanta	Beckman Research Institute of the City of Hope	\$249,000
IDEA	2010	Salivary Biomarkers for Early Detection of Breast Cancer	Zhang, Lei	UCLA	\$123,748
IDEA	2010	Targeting Drug Resistant Breast Cancer by microRNAs	Hu, Hailiang	UCLA	\$100,000
IDEA	2010	Targeting Brain Metastasis with a Cell-based Approach	Felding, Brunhilde, Lorger, Mihaela	Scripps Research Institute	\$284,354
IDEA	2010	New Estrogen Receptor Downregulators for Breast Cancer	Pietras, Richard	UCLA	\$150,000
IDEA	2010	Inhibiting Breast Cancer Brain Metastasis with Cilengitide	Felding, Brunhilde	Scripps Research Institute	\$284,435
IDEA	2010	Multimarker miR Blood Assay for Breast Cancer Detection	Hoon, David	John Wayne Cancer Institute	\$265,415
IDEA	2010	Breast Cancer Neoadjuvant Chemotherapy Response with miRNA	Wang, Shizhen Emily	Beckman Research Institute of the City of Hope	\$249,000
IDEA	2010	Enhancing Trastuzumab Therapy with an NK Activating Antibody	Levy, Ronald	Stanford University	\$224,749
IDEA	2010	HER2 Co-Amplified Genes and Treatment Response	Press, Michael	University of Southern California	\$241,988

Award Type	Year Funded	Title	Investigator(s)	Institution(s)	Dollars
IDEA	2010	Receptor Re-expression in ER and PR Negative Breast Cancer	Holmes, Dennis Garcia, Agustin	University of Southern California	\$18,203
IDEA	2011	Targeting Histone Acetyltransferase in Triple Negative BC	Gjerset, Ruth	Torrey Pines Institute for Molecular Studies	\$272,995
IDEA	2011	Identifying Novel Drugable Targets Against TNBC	Goga, Andrei	UCSF	\$150,000
IDEA	2011	Targeting Prolactin as a Novel Treatment for Breast Cancer	Walker, Ameae	UC Riverside	\$150,000
IDEA	2012	Sub-millimeter PET for Improving Outcomes in Breast Cancer	Chaudhari, Abhijit	UC Davis	\$149,332
IDEA	2012	Host Hypoxia to Treat Breast Cancer Brain Metastasis	Felding, Brunhilde	Scripps Research Institute	\$284,250
IDEA	2012	Genetic Predictors of Chemotherapy Toxicity in Breast Cancer	Kroetz, Deanna	UCSF	\$99,998
IDEA	2012	Compositional Mammography for Breast Cancer Detection	Shepherd, John	UCSF	\$149,895
IDEA	2012	Co-Targeting the Notch and EphB4 Receptors in Breast Cancer	Tripathy, Debasish	University of Southern California	\$243,362
IDEA	2013	Radiation-Induced Migration of Breast Cancer Cells	Graves, Edward	Stanford University	\$234,189
IDEA	2013	A First-in-class Allosteric RAF Inhibitor for Breast Cancer	Cheresh, David	UC San Diego	\$187,500
IDEA	2014	Drug to Block Double-strand Break Repair in Breast Cancer	Chu, Gilbert	Stanford University	\$135,436
IDEA Competitive Renewal	2007	Early Breast Cancer Detection Using 3D Ultrasound Tomography	Nelson, Thomas	UC San Diego	\$225,000
IDEA Competitive Renewal	2008	Topoisomerase-IIa as a Predictor of Anthracycline Response	Press, Michael	University of Southern California	\$405,393
IDEA Competitive Renewal	2009	Modulation of Breast Cancer Stem Cell Response to Radiation	Pajonk, Frank	UCLA	\$250,000
IDEA Competitive Renewal	2011	Reducing Surgical Morbidity of Breast Cancer Staging	Chen, Steven	Beckman Research Institute of the City of Hope	\$272,483
IDEA Competitive Renewal	2011	Combating Breast Cancer with the Wellderly Immune Repertoire	Felding, Brunhilde	Scripps Research Institute	\$473,750
Joining Forces Conference Award	2011	7th International Symposium on the Intraductal Approach	Love, Susan	Dr. Susan Love Research Foundation	\$25,000

Award Type	Year Funded	Title	Investigator(s)	Institution(s)	Dollars
Joining Forces Conference Award	2014	UCSF Breast Oncology Program Scientific Retreat	van't Veer, Laura	UCSF	\$8,023
Joining Forces Conference Award	2015	UCSF Breast Oncology Program Scientific Retreat	van't Veer, Laura	UCSF	\$12,000
Postdoctoral Fellowship	2009	Compounds Blocking Assembly of LRH-1 in Breast Cancer	Benod, Cindy	UCSF	\$90,000
Postdoctoral Fellowship	2009	Chemerin as an Immunotherapeutic Agent in Breast Cancer	Pachynski, Russell	Palo Alto Institute for Research & Education	\$89,600
Postdoctoral Fellowship	2010	The Role of ANCCA in Tamoxifen Resistant Breast Cancer	Andrews, Nicolas	UC Davis	\$84,822
Postdoctoral Fellowship	2010	MRI Guided Focused Ultrasound in Breast Cancer Treatment	Bitton, Rachel	Stanford University	\$88,257
Translational Research Award	2007	Intraductal Therapy of DCIS: A Presurgery Study	Love, Susan	Dr. Susan Love Research Foundation	\$851,559
Translational Research Award	2008	Stratifying DCIS Biopsies for Risk of Future Tumor Formation	Tlsty, Thea	UCSF	\$750,000
Translational Research Award	2008	Genetics of Tamoxifen Response	Ziv, Elad	UCSF	\$803,111
Translational Research Award	2010	Measuring Real-world Breast Cancer Outcomes	Kurian, Allison	Stanford University	\$1,066,225
Translational Research Award	2010	Towards Highly Effective Inactivation of HER2-HER3 Signaling	Moasser, Mark	UCSF	\$744,957
Translational Research Award	2011	Vitamin D and Breast Cancer in Obesity: Therapeutic Trials	Feldman, David	Stanford University	\$1,156,703

* Grant titles in this table may appear to repeat due either phased research (a pilot grant followed by a full research grant) or due to continuation grants being given.

Table 18: Detection, Prognosis and Treatment Funding in Progress as of 2015

Award Type	Year Funded	Title	Investigator(s)	Institution(s)	Dollars
IDEA	2013	Vitamin D Signals Via a Novel Pathway to Inhibit Metastasis	Feldman, Brian	Stanford University	\$236,434
IDEA	2013	Expression Profiling of Circulating Tumor Cells	Lang, Julie	University of Southern California	\$244,756
IDEA	2013	Imaging, Genomics, and Glycoproteomics for Cancer Detection	Pitteri, Sharon	Stanford University	\$235,500
IDEA	2013	Intranasal Drug Delivery for Brain Metastatic Breast Cancer	Schonthal, Axel	University of Southern California	\$242,530

Award Type	Year Funded	Title	Investigator(s)	Institution(s)	Dollars
IDEA	2014	Gut Microbiota in Association with Chemotherapy Treatment	Wu, Anna	University of Southern California	\$246,937
IDEA	2014	A Novel TNBC Therapeutic Opportunity: Cystine Addiction	Timmerman, Luika	UCSF	\$187,500
IDEA	2014	CT-guided DOT for Breast Cancer Imaging	Li, Changqing	UC Merced	\$193,750
IDEA	2014	Sulindac-derived Compounds for Breast Cancer Therapy	Zhang, Xiao-Kun	The Burnham Institute for Medical Research	\$292,498
Translational Research Award	2012	Using Epigenetic Changes to Stratify DCIS Biopsies	Tlsty, Thea	UCSF	\$750,000
Translational Research Award	2012	Predicting Breast Cancer Recurrence to Improve Care	Esserman, Laura	UCSF	\$793,127
Translational Research Award	2013	Cardiovascular Toxicity Following Aromatase Inhibitor Use	Haque, Reina	Kaiser Foundation Research Institute	\$501,034

E. Funding and Research Details: Biology of the Breast Cell

To understand the origin of breast cancers, more research is needed on the pre-cancerous, causative events in the normal breast. Research in recent years increasingly points to the importance of looking at breast development at different stages of development, such as embryonic and pubertal development of the gland. By studying the different stages of breast development, researchers are better able to understand when girls and women are most vulnerable and most susceptible to increased risk for breast cancer.

Studying the biology of the breast cell we can infer what is creating the conditions that may later develop into breast cancer. In breast development, cell populations must coordinate migration, proliferation, and apoptosis (cell death) over space and time. In cancer progression these processes become deregulated, initially at the genetic level that leads to the physiological changes associated with malignancy.

It is not just mutations in DNA that can lead to a cell becoming cancer, but changes to the way the DNA is modified, folded, and packaged, called epigenetics, which can turn on or off the ability of the DNA to code for proteins. An inability to recognize and properly repair damage to DNA that occurs in normal cell physiology and can be enhanced by environmental factors is recognized as a driving force of cancer progression. The interaction between different types of cells in the breast increasingly is found to play a critical role in the regulation of normal growth and differentiation. Studying the normal way that cells move and communicate with each other provides insights into the processes that go awry as cancers become more aggressive and metastasize.

Researchers funded by CBCRP have gained understanding in the short-term increased risk for breast cancer after pregnancy, developed a model for understanding the interaction between breast cancer cells and fat cells, and found markers that help detect breast cancer earlier and more accurately.

Two of CBCRP's research areas are presented in this section:

- Biology of the Normal Breast: The Starting Point
- Pathogenesis: Understanding the Disease

CBCRP invested over \$6.7 million dollars in 38 investigator initiated biology of the breast cell research projects that were conducted between 2010 and 2015. Below are highlights of a selection of research projects CBCRP has funded, followed by Tables 19 and 20 listing all research that was concluded between 2010 and 2015 and in progress (respectively) for all research related to biology of the breast cell.

Highlights of Funding Concluded in 2010–2015

Examining Metastatic Potential in Mammary Stem Cells

Jay Desgrosellier of **UC San Diego** found that a molecule, integrin alpha v beta 3, that is highly expressed in metastatic breast cancer cells is also found in breast cancer stem cells necessary for normal mammary stem cell behavior and mammary gland formation during pregnancy. There is an increased short-term risk for a highly aggressive form of breast cancer following each pregnancy, and this study's findings may explain why this happens. Findings were published in *Developmental Cell* in August 2014.

Local Adipocyte Function in Breast Cancer

Obesity is a risk factor for the development of postmenopausal breast cancer (but is protective against premenopausal breast cancer). Adipocytes (fat cells) increase in number and size in obesity and are abundant in the mammary microenvironment. These cells produce endocrine, inflammatory, and angiogenic factors that have tremendous potential to affect adjacent breast cancer cells. **Barbara Mueller** of **Torrey Pines Institute for Molecular Studies** developed a model for investigating the interaction between breast cells and fat cells. She was able to demonstrate that hormone-dependent human breast cancer cells, which are not tumorigenic when injected into mice by themselves, grow tumors when they are inoculated together with fat cells. Importantly fat cells are only able to support tumor growth when they are in direct contact with the breast cancer cells and not when they are at a distant site in the same mouse. Given the extent of obesity, this finding opens the door to greater understanding of potential causes of breast cancer and possibly interventions. Findings were published in *Adipocyte* in July 2013.

Stroma Expression Patterns in Breast Cancer

The earliest recognizable stages of breast neoplasia (tumor development) are several types of cell lesions; however, there has been inadequate information on how to detect and interpret these lesions. To address this gap, **Robert West** of **Palo Alto Institute for Research & Education** undertook the first global examination of gene expression within early neoplasias. He identified several features that appear to characterize early neoplasias as a whole and represent insights into this very early stage of cancer development. His findings will help researchers to accurately profile invasive ductal carcinoma, ductal carcinoma in situ, early neoplasias and normal breast tissue within the same patient. This type of information has the potential to significantly improve efforts in breast cancer detection and prevention. Findings were published in *Genome Biology* in May 2014 and the *Journal of Pathology* in October 2010.

Discovery of Fusion Genes in Breast Cancer

Understanding fusion genes, or genes that form from two previously separate genes, can provide both diagnostic markers and therapeutic targets for cancer. Despite progress in understanding

fusion genes in other cancers, until **Jonathan Pollack** of **Stanford University** undertook his CBCRP-supported research, there was very little understanding of the role of fusion genes in breast cancer. His analysis showed that gene fusion may have both a causal role in breast cancer as well as be required for cancer cell growth. This new knowledge shows great potential to support improved diagnosis and therapy for breast cancer. Findings were published in *PLOS Genetics* in April 2013.

Table 19: Biology of the Breast Cell Funding that Concluded in 2010–2015

Award Type	Year Funded	Title	Investigator(s)	Institution(s)	Dollars
Dissertation Award	2008	Role of Estrogen-modulated Protein AGR2 in Breast Cancer	Geyfman, Mikhail	UC Irvine	\$71,491
Dissertation Award	2009	A Genetic System for Identification of Mammary Stem Cells	Engle, Dannielle	Salk Institute for Biological Studies	\$76,000
Dissertation Award	2009	Substrate Profiling of Breast Cancer Related Proteases	Dix, Melissa	Scripps Research Institute	\$76,000
Dissertation Award	2009	The Role of Estrogen Receptor in Endocrine Resistance	Chan, Hei	Beckman Research Institute of the City of Hope	\$76,000
Dissertation Award	2010	Pharmacological Modulation of PP2A Activity in Breast Cancer	Bachovchin, Daniel	Scripps Research Institute	\$29,366
IDEA	2008	Nanolipoproteins to Study Breast Cancer Growth Receptors	Henderson, Paul	UC Davis	\$99,000
IDEA	2009	A Molecular Strategy to Inhibit Breast Cancer Metastasis	Brodsky, Frances	UCSF	\$150,000
IDEA	2009	Novel Tumor Suppressors in Breast Development and Cancer	Fuller, Margaret	Stanford University	\$230,373
IDEA	2009	Role of p68 in Breast Cancer	Wang, Daojing	Lawrence Berkeley National Laboratory	\$165,335
IDEA	2009	Podocalyxin as a Basal-like Breast Cancer Stem Cell Marker	Casey, Graham	University of Southern California	\$243,676
IDEA	2009	The Role of EGF Variant mLEEK and Grp78 in Breast Cancer	Wong, Albert	Stanford University	\$241,380
IDEA	2009	Proline Metabolism in Metastatic Breast Cancer	Richardson, Adam	The Burnham Institute for Medical Research	\$284,895
IDEA	2009	Discovery of Fusion Genes in Breast Cancer	Pollack, Jonathan	Stanford University	\$160,000
IDEA	2009	Finding BRCA1 Ubiquitinated Substrates in Breast Cancer	Spruck, Charles, del Rincon, Sonia	The Burnham Institute for Medical Research	\$191,000
IDEA	2009	Breast Cancer Tumor-Stroma Interactions in an In Vivo Model	Borgstrom, Per	Vaccine Research Institute of San Diego	\$279,336

Award Type	Year Funded	Title	Investigator(s)	Institution(s)	Dollars
IDEA	2010	Local Adipocyte Function in Breast Cancer	Mueller, Barbara	Torrey Pines Institute for Molecular Studies	\$272,993
IDEA	2010	Inhibiting Mutation to Prevent and Treat Breast Cancer	Romesberg, Floyd	Scripps Research Institute	\$63,021
IDEA	2010	Complement-mediated Stem Cell Recruitment to Breast Cancer	Schraufstatter, Ingrid	Torrey Pines Institute for Molecular Studies	\$136,500
IDEA	2010	p97 as a Therapeutic Target in Breast Cancer Metastasis	Latterich, Martin	Proteomics Research Institute for Systems Medicine	\$292,500
IDEA	2010	Reelin Signaling Involvement in Breast Cancer Cell Migration	Carpenter, Ellen	UCLA	\$149,493
IDEA	2010	Myeloperoxidase Mediated Protection in Breast Cancer	Reynolds, Wanda	The Burnham Institute for Medical Research	\$286,500
IDEA	2011	Molecular Classification of Early Breast Neoplasia	West, Robert	Stanford University	\$156,561
IDEA	2011	Novel Cell-matrix Markers and Drivers of Breast Cancer	Muschler, John	California Pacific Medical Center Research Institute	\$262,500
IDEA	2011	Breast Cancer-secreted MicroRNAs in the Pre-metastatic Niche	Wang, Shizhen Emily	Beckman Research Institute of the City of Hope	\$252,000
IDEA	2012	Establishing Cell Lifespans in Cancer and Normal Breast	Borowsky, Alexander	UC Davis	\$155,728
IDEA	2012	Examining Metastatic Potential in Mammary Stem Cells	Desgrosellier, Jay	UC San Diego	\$150,000
IDEA	2012	Understanding HER3 and mTor Signaling in Breast Cancer	Moasser, Mark	UCSF	\$100,000
IDEA	2012	Rescuing HR DNA Repair in BRCA1-Mutation Carriers	Stark, Jeremy	Beckman Research Institute of the City of Hope	\$166,406
IDEA Competitive Renewal	2009	Stroma Expression Patterns in Breast Cancer	West, Robert	Palo Alto Institute for Research & Education	\$164,403
				Stanford University	\$188,097
Postdoctoral Fellowship	2008	Global Analysis of Protein Ubiquitination in Breast Cancer	Grotegut, Stefan	The Burnham Institute for Medical Research	\$89,558

Award Type	Year Funded	Title	Investigator(s)	Institution(s)	Dollars
Postdoctoral Fellowship	2008	Regulation of Breast Stem-Progenitor Cell Chromatin by Pygo2	Gu, Bingnan	UC Irvine	\$135,000
Postdoctoral Fellowship	2009	Targeting MYC in Human Breast Cancer	Horiuchi, Dai	UCSF	\$90,000
Postdoctoral Fellowship	2009	P32: New Functional Target in Breast Cancer Brain Metastasis	Staflin, Karin	Scripps Research Institute	\$71,577
Postdoctoral Fellowship	2009	Control of BRCA2-mediated Homologous Recombination	Meyer, Damon	UC Davis	\$90,000
Postdoctoral Fellowship	2010	The Role of Twist1 in Epithelial-mesenchymal Transition	Tsai, Jeff	UC San Diego	\$90,000
Postdoctoral Fellowship	2010	The Role of Clim Proteins in Breast Cancer	Verma, Suman	UC Irvine	\$37,961
Postdoctoral Fellowship	2010	The Role of microRNAs in Triple-Negative Breast Cancer	Kusdra, Leonard	UCSF	\$89,200

Table 20: Biology of the Breast Cell Funding in Progress as of 2015

Award Type	Year Funded	Title	Investigator(s)	Institution(s)	Dollars
IDEA	2014	Mechanical Stressors and Age as Regulators of Telomerase	LaBarge, Mark	Lawrence Berkeley National Laboratory	\$219,077
IDEA	2014	Systemic Metabolic Reprogramming by BC-Secreted MicroRNAs	Wang, Shizhen Emily	Beckman Research Institute of the City of Hope	\$252,000
IDEA	2014	Targeting Breast Cancer Metastasis to Bone	Contag, Christopher	Stanford University	\$240,750

V. Program Highlights, 2010–2015

CBCRP remains a leader in engaging communities in the research process, ensuring research is not just conducted with scientific rigor but also is designed to address real needs, such as policy changes, and distributing the information and lessons learned through its funded research. Below are some examples of how CBCRP is expanding the role of research in addressing real world problems.

Fostering Community Based Participatory Research

CBCRP has been a national leader in engaging community members in research. In 1997, CBCRP pioneered the Community Research Collaboration awards (CRC). These grants allow community groups and breast cancer advocacy organizations to team up with experienced scientists to pursue research important to the community in a scientifically rigorous way. This approach to research is called community-based participatory research (CBPR). CRC awards are open to nonprofit organizations or *ad hoc* community groups in any California community affected by breast cancer. They support scientists and community members to work in partnership conducting CBPR focused on environmental links to breast cancer and health disparities and breast cancer risk.

There are four overarching areas of benefit to conducting CBPR:

1. Research quality is improved
2. Communities are strengthened and empowered
3. Scientists are strengthened
4. Public health is improved, as the research is linked directly to communities efforts to advocate on their own behalf

In 2010–2015, CBCRP provided \$6,837,532 million in funding to 19 collaborative projects conducted by 29 different California institutions and community groups.

Community-based Research Infrastructure to Better Science (CRIBS)

Despite the success of growing investment in CBPR, evaluations conducted by CBCRP showed that community groups would greatly benefit from training in various aspects of conducting scientific research. Additionally, scientists and community groups could greatly benefit from a collaborative learning process to build their research partnership. To address this, CBCRP made significant investments in CBPR capacity-building in recent years.

Beginning in 2010, the National Institute of Environmental Health Sciences (NIEHS) recognized CBCRP's leadership in community-based participatory research by funding an in-depth training program (Award Number 1RC4ES019826). In collaboration with the nonprofit organization Commonweal and the training and coaching organization Plumblin Consulting, CBCRP's Community-based Research Infrastructure to Better Science (CRIBS) training prepared research teams to develop winning research proposals to address the link between environmental exposures, health disparities and breast cancer risk.

Twelve diverse teams of 33 community members and scientists from across the state took part in the training from January 2011 to January 2012. It included ten days of in-person training, seven online sessions, technical assistance calls and a “mock” review of trainees funding proposals. Every one of the teams trained submitted research applications to CBCRP. Of the 12 applications from CRIBS fellows, 33 percent were funded by CBCRP on the first attempt, an impressive success rate. Further, 80 percent of CRC pilot grant applications funded in 2013 by CBCRP came from the CRIBS cohort. In 2014 one additional CRIBS team resubmitted an application and was funded. In total, five out of 12 teams (42 percent) were eventually funded through CBCRP as of 2015.

QuickStart Training

Building on the success of CRIBS, CBCRP, Commonweal and Plumblin offered a revised version of CRIBS. This training, renamed “QuickStart,” was updated and shortened based on evaluations of CRIBS. QuickStart was offered in the summer of 2014 through a grant from CBCRP to Commonweal. The training program was shortened to six days of face-to-face training, seven weekly online sessions, two technical assistance phone calls and various written assignments (including developing a partnership plan and drafting a grant proposal) over the course of 12 weeks. After the 12 weeks, a mock review of proposals was held in January 2015.

Six of the 10 teams from the QuickStart training submitted applications for the 2015 CRC award. One team was awarded a planning grant (17 percent) and two teams were awarded pilot funding (33 percent), for a total of 50 percent awarded funding of those who applied.

In 2014, CBCRP, Commonweal and Plumblin were awarded a four-year grant from the National Cancer Institute of the National Institutes of Health (Award Number R25CA188482). This will allow for four more rounds of QuickStart training, which will largely follow the model of training used in 2014. The next round of QuickStart training is anticipated to start in Spring 2016.

Technical Assistance

In addition to the intensive training opportunities, CBCRP also offers free technical assistance support to people interested in engaging in CBPR. One-on-one technical assistance calls provide support as teams prepare their CRC application. Teams also can have a pre-application research plan review, in which research plans are critiqued by active CBPR researchers before the formal application is submitted. CBCRP staff are also available by phone for teams to debrief and plan how to respond to the feedback. CBCRP also offers webinars to help prospective teams understand the application process and requirements.

Policy Initiative: New Funding mechanism

As part of our program-initiated research, CBCRP launched the Policy Initiative in 2015. This funding mechanism allocates \$150,000 annually for a rapid-response, policy-related research related to prevention, detection, and treatment of breast cancer, as well as research into the formulation of policy alternatives that will reduce the incidence of and morbidity and mortality from breast cancer in California. To implement the Policy Initiative, science, advocate, and policy experts as well as interested individuals and organizations contribute to the development of policy topics, research questions and recommendations made to the Research Council. The goal is to fill a critical gap to allow policy changes to be grounded in science that is relevant and credible.

In this context, policy is defined broadly as “a law, regulation, procedure, administrative action, incentive, or voluntary practice adopted or proposed by a local, regional, tribal, state or federal government, business, organization, or institution that will reduce the incidence of and/or the morbidity and mortality from breast cancer in California.”

The Policy Initiative is guided by a Research Council policy committee, a Policy Research Advocacy Group (PRAG), made up of California-based policy-makers (state legislators, state and federal legislative staff, former state governmental staff), representatives of organizations involved in breast cancer-related policy development and advocates, individual topic nominators and peer reviewers from outside California (see Appendix 5). The PRAG is tasked with providing ideas and guidance in the identification and development of policy topics relevant to California and to recommend to the Research Council a prioritized policy topic(s) for the Policy Initiative.

In early 2015, a Request for Qualifications was released to select teams of on-call investigators to conduct rapid response research for our new Policy Initiative. Awarded funds may be dedicated to one team or spread out over multiple teams, depending on the complexity of the topics and the potential for impact of the projects. Two teams were selected in June 2015 and will remain the Policy Initiative On-Call Teams until June 2018. They are:

- **Health Policy Research for Cancer Prevention and Control team**, led by Ninez Ponce at UCLA’s Center for Health Policy Research (CHPR) and its Center for Cancer Prevention and Control Research (CPCR).
- **Rapid Response for Environmental Research team (RaRE Research)**, led by Peggy Reynolds at Cancer Prevention Institute of California and Bob Harrison at the California Department of Public Health Occupational Health Branch

The first policy topic to be researched is: *What are the significant barriers or challenges to access to breast cancer oncology care if you are uninsured, underinsured, on public or private insurance?* Research is expected to start late 2015.

Symposium

In May 2013, CBCRP hosted a two-day statewide symposium “From Research to Action: Celebrating Two Decades of Change,” commemorating twenty years of innovative research. More than 300 advocates, scientists, health care providers, policy makers and public citizens gathered to learn about the advances made in breast cancer research and the work that has yet to be done.

The audience was comprised of 47 percent of people who described themselves as patients, advocates or general public. Their participation was supported in part by a \$10,000 conference grant from the NIEHS and NCI (1R13 ES022921-01) to support travel scholarships for breast cancer advocates to attend the event. The attendees’ diverse experiences with breast cancer provided a unique opportunity to exchange ideas and build new networks.

Highlights of the symposium program included a keynote by Susan Love, a visionary in the breast cancer research field, where she shared her journey in breast cancer research and CBCRP’s role in “pushing the envelope.” Dennis Slamon, a leader whose work resulted in a breakthrough treatment for breast cancer, also gave a keynote on how CBCRP’s advancements have driven down breast cancer mortality.

More than 15 plenary sessions were offered on topics including environmental links to breast cancer, disparities in breast cancer, community involvement in breast cancer research and others. Two sessions, “The Role of Research in Setting Breast Cancer Policy” and “Changing Federal Priorities for Breast Cancer Research,” demonstrated how we are on the verge of a sea change in how we approach research in the coming years.

Illustrated Posters depicting the results of 35 research projects funded by CBCRP were on display throughout the symposium. Researchers were on hand for a poster viewing session where they could answer questions and receive comments about their research directly from the public and their scientific colleagues.

The full program booklet is available at <http://www.cabreastcancer.org/files/symposia-docs/2013symposium-booklet.pdf>. Select videos from the symposium are available at <http://vimeopro.com/vcube/cbcpr-2013>.

Conferences

CBCRP funded 11 conferences during this reporting period (2010–2015). Examples include the Stanford Cancer Institute 2nd Annual Conference on Breast Cancer and African Americans in 2013, the National Latino Cancer Summit in 2010 and 2012, and GIS for Community Impact: From Technology to Translation in 2015.

Sharing Progress with Scientists and the Public

CBCRP prides itself on transparency and proactive communication with the public. There are numerous online and in-person ways this is done:

- **Website:** In 2014, CBCRP undertook a comprehensive overhaul of their website. Significant effort was made to make information available in clearer, more concise ways. Additionally, navigation was greatly improved so information is considerably easier to find. Some of the features on the website include:
 - Links between abstracts of research supported by CBCRP funding to the publications that report results through the National Institutes of Health’s PubMed, a public-access database of biomedical journals
 - Funding opportunity announcements and technical assistance for applying for grants
 - Downloadable versions of all CBCRP publications
 - Opportunities to request specific information from CBCRP, and make online donations to CBCRP
 - Reports on progress and outcomes of CBCRP’s research strategy development
- **E-newsletter:** CBCRP’s email newsletter gives subscribers timely announcements of funding opportunities, early notification of new research resources and breast cancer conferences, and avenues to stay involved, informed, and active in the fight against breast cancer. It is distributed to over 2,800 stakeholders each month.
- **Facebook and Twitter:** CBCRP currently has nearly 2,000 likes of our Facebook page. Our Facebook page presents up-to-date information about breast cancer research, along

with an online space to exchange ideas, ask questions, and follow links to information about CBCRP-funded research studies. Facebook users can also access invitations to events such as the CBCRP symposium, announcements of new CBCRP publications, and links to other breast-cancer-related organizations. The Program's Twitter feed also keeps followers current about breast cancer research and opportunities to take part in CBCRP activities.

- **Serving the Media:** CBCRP does regular outreach to the media about the Program and about CBCRP-funded research projects that are of interest to the general public. When reporters from TV, newspapers, magazines, or other media need information on breast cancer research, CBCRP links them with the appropriate experts. News about CBCRP and research funded by CBCRP also appeared over the past year in local California newspapers, and on a variety of general news, health news, international news, and blog Web sites.

For example, Mhel Kavanaugh-Lynch was featured in the documentary “Pink Ribbons, Inc.,” which explores the complexity and controversy of the use of pink ribbons as marketing tools for breast cancer fundraising. Dr. Kavanaugh-Lynch was also a co-author of an opinion piece in *Science Magazine* in response to *Science* dedicating a full issue to breast cancer but leaving out the body of scientific evidence linking toxic chemicals and radiation to breast cancer.

- **Speakers and Educational Bureau:** When community organizations want speakers on breast cancer research for meetings and public events, CBCRP provides referrals from the Program’s network of researchers and advocates. The Program also refers research experts to teach continuing education classes for healthcare professionals.
- **Scientific Presentations at Conferences:** CBCRP staff and CBCRP-funded researchers present research results at scientific conferences. Examples include:
 - Institute of Medicine Committee on Breast Cancer and the Environment, “The Scientific Evidence, Research Methodology, and Future Directions,” San Francisco, CA July 6–8, 2010. Mhel Kavanaugh-Lynch, presenter.
 - California Black Women’s Health Project Policy Summit, Sacramento, CA May 9, 2011. Catherine Thomsen, presenter.
 - 7th International Symposium on the Intraductal Approach to Breast Cancer: The Normal Human Breast: Building our Understanding from Mice to Women, “Translational and Community-Based Funding Opportunities at the California Breast Cancer Research Program.” Santa Monica, CA February 23-26, 2011. Mhel Kavanaugh-Lynch, presenter.
 - Interagency Breast Cancer and Environmental Research Coordinating Committee” California Breast Cancer Research Program: Special Research Initiatives” San Francisco, CA February 23, 2011. Mhel Kavanaugh-Lynch, presenter.
 - 28th Annual Women in Medicine Conference, “Environmental Chemicals & Cancer” July 26, 2011. Stowe, VT Mhel Kavanaugh-Lynch, presenter.
 - Washington Hospital, “Chemicals & Breast Cancer” Fremont, CA October 13, 2011. Mhel Kavanaugh-Lynch, presenter.

- American Association for Cancer Research Frontiers in Breast Cancer Research, Anaheim, CA October 15–20, 2012. Catherine Thomsen, presenter.
 - American Association for Cancer Research, “The Science of Cancer Health Disparities in Racial/Ethnic Minorities and the Medically Underserved” San Diego, CA October 27–30, 2012. Senaida Fernandez, presenter.
 - American Public Health Association’s 140th Annual Meeting and Expo, “What’s Causing Cancer Disparities? The Roles of the Social and Physical Environments across the Lifespan” San Francisco, CA October 31, 2012. Catherine Thomsen, presenter.
 - Breast Cancer Fund’s Pioneering Prevention, “Ushering in a new era in the breast cancer movement” May 30, 2013 San Francisco, CA. Mhel Kavanaugh-Lynch, presenter.
 - American Public Health Association’s annual conference, November 6, 2013. Poster titled “Evaluation of community-academic partnerships after participation in an intensive CBPR training program” Boston, MA Senaida Fernandez, Catherine Thomsen, Mhel Kavanaugh-Lynch, presenters and can be viewed at: <https://apha.confex.com/apha/141am/webprogram/Paper292452.html>.
 - Breast Cancer and the Environment Research Program of the National Institutes of Environmental Health Sciences and National Cancer Institute, Extended Environmental Exposures Annual Meeting, Future Directions in Breast Cancer and the Environment, “A Midstream View of the California Breast Cancer Prevention Initiative.” November 8, 2013, Madison, WI. Mhel Kavanaugh-Lynch, presenter.
 - National Summit on Cancer in the LGBT Community, NYC, “Breast and Gynecological Cancer in the LGBT Community,” New York, NY January 18, 2014. Mhel Kavanaugh-Lynch, presenter.
 - American Cancer Society Cancer and the Environment Team, “California Breast Cancer Research Program—Program Initiatives,” November 3, 2014. Mhel Kavanaugh-Lynch, presenter.
- **Exhibits at community meetings:** CBCRP presented displays of the program’s work at a number of community events and scientific meetings during 2010–2013 (CBCRP stopped exhibiting in 2013 due to reduced staffing). Examples include:
 - 7th International Symposium on the Intraductal Approach to Breast Cancer, Santa Monica, February 23–25, 2011
 - The North Face Benefit Fair, San Leandro, October 5–6, 2011
 - Breast Cancer and African American Women: Messages that Count, San Francisco, October 7, 2011
 - AACR Advances in Breast Cancer, October 12–15, 2011
 - 11th Annual Allison Taylor Holbrooks/Barbara Jo Johnson Breast Cancer Conference, San Francisco, March 3, 2012
 - Young Women’s Breast Health Summit, San Francisco, March 31, 2012
 - Linking Tobacco Control Research and Practice for a Healthier California, Sacramento, April 10–12, 2012
 - American Society for Investigative Pathology 2012 Annual Meeting, San Diego, April 21–25, 2012

- The Global Chinese Breast Cancer Organizations Alliance (GCBCOA) 4th Global Chinese Breast Cancer Organizations Alliance Conference, Pasadena, April 25–28, 2012
- 12th Annual Conference Breast Cancer & African Americans, Oakland, May 5, 2012
- African American Community Health Advisory Committee’s Soul Stroll 2012, San Mateo, May 19, 2012
- Susan G. Komen’s Many Faces One Voice Conference, San Francisco, June 18, 2012
- Latinas Contra Cancer, Mission Bay SF, July 24–25, 2012
- American Association for Cancer Research Frontiers in Breast Cancer Research, Anaheim, October 15–20, 2012
- American Public Health Association’s 140th Annual Meeting and Expo, San Francisco, October 27–31, 2012
- American Association for Cancer Research The Science of Cancer Health Disparities in Racial/Ethnic Minorities and the Medically Underserved, San Diego, October 27–30, 2012
- 2nd Annual Breast Cancer & African Americans Conference, Oakland, May 4, 2013
- ActNOW: Oakland, June 8, 2013

Publications

In 2007, CBCRP released *Identifying Gaps in Breast Cancer Research*. This research paper reviewed previous research in two areas covered under the CBCRP’s Special Research Initiatives: environmental links to breast cancer and the reasons why some groups of women bear a greater burden of the disease. Through the CBCPI process, the report was updated by the UCSF Program on Reproductive Health and Environment and CBCRP. In 2013 the updated report, called [California Breast Cancer Research Program Prevention Initiatives \(CBCPI\) Gaps Supplement: Targeted Scans of the 2007 “Gaps” Document “Identifying Gaps in Breast Cancer Research: Addressing Disparities and the Roles of the Physical and Social Environment](#), was released.

Additionally, CBCRP staff were published in several academic publications. Examples include:

- J. Green Brody, R.A. Rudel, M. Kavanaugh-Lynch. Testing Chemicals for Effects on Breast Development, Lactation, and Cancer. *Environ Health Perspect* 119:a326-a327 (2011).
- P. Sutton, M.H.E. Kavanaugh-Lynch, M. Plumb, I.H. Yen, H. Sarantis, C.L. Thomsen, S. Campleman, E. Galpern, C. Dickenson, T.J. Woodruff. California Breast Cancer Prevention Initiatives: Setting a research agenda for prevention. *Reprod Toxicol*. 2015 Jul; 54:11-8.
- Senaida Fernandez, Marj Plumb, Catherine Thomsen, Susan Braun, Heather Sarantis, Juliana van Olphen, Emily Galpern, Marion Kavanaugh-Lynch. Technical assistance as part of capacity building for collaborative research in breast cancer, the environment, and/or disparities. [abstract]. In: Proceedings of the Fifth AACR Conference on the Science of Cancer Health Disparities in Racial/Ethnic Minorities and the Medically Underserved; 2012 Oct 27–30; San Diego, CA. Philadelphia (PA): AACR; *Cancer Epidemiol Biomarkers Prev* 2012;21(10 Suppl):Abstract nr B05.

- Juliana Elizabeth Van Olphen, Senaida Fernandez, Marj Plumb, Heather Sarantis, Catherine Thomsen and Emily Galpern. Evaluation of community-academic partnerships after participation in an intensive CBPR training program. Conference: 141st APHA Annual Meeting and Exposition 2013.

Awards and Recognition

CBCRP received one award in this reporting period. In November 2011, CBCRP was recognized at the National Coalition for Cancer Survivorship's 25th Annual Rays of Hope® Gala winning its most prestigious award, the Catherine Logan Award for Service to Survivorship.

In October 2014, CBCRP was recognized by *Money Magazine* for leadership in research quality, accountability, and integrity. The magazine identified CBCRP as one of five charitable organizations that are making the biggest impact against breast cancer. The article noted: "These organizations have high levels of accountability, have successfully sustained their programs over time, and spend a high percentage of their revenue on programs and services rather than administrative or fundraising costs." CBCRP was chosen in particular for research quality, focus on prevention, and because 95 percent of the revenue goes directly to funding breast cancer research and education.

VI. Activities to Increase Funding for Breast Cancer Research and Awareness of Breast Cancer Research

Funding for CBCRP from the State tobacco tax decreases every year. Moreover, current funds are not sufficient to do all that needs to be done. During 2010–2015, CBCRP turned down investigator-initiated grant applications requesting a total of \$26,447,895 that were rated by expert reviewers as having sufficient scientific merit for funding. Commitment and action are needed to ensure our present funding sources and increase funds from new sources. CBCRP does this by increasing awareness of breast cancer research through public education and offering a high-publicity award, the Faith Fancher Research Award. CBCRP also actively fundraises through a California state income tax checkoff program, private foundations and donations from the public. Progress in these areas is highlighted in this section.

Increasing Voluntary Donations to the California State Income Tax Checkoff Program

To address the pressing need to increase funds, CBCRP established the Community Partners Program, which pursues two goals:

- Increasing donations to CBCRP through the California income tax voluntary contribution program and new sources
- Increasing public awareness of breast cancer, breast cancer research, and the California Breast Cancer Research Program

CBCRP conducts outreach campaigns focused on raising awareness of breast cancer research results and the Program’s work to encourage donations through state tax return contributions. A special CBCRP website, “405–Check the Box Fund the Fight” (<http://www.endbreastcancer.org>), informs stakeholders about fundraising progress. It also summarizes progress researchers achieved with the grants funded via contributions made on state income tax returns. CBCRP has used Google, Facebook and YouTube ads to alert California taxpayers to these resources.

To further increase state tax return contributions, President Janet Napolitano and Provost and Executive Vice President Aimée Dorr sent letters to over 180,000 University of California employees notifying them of the opportunity to contribute to the fund. CBCRP also conducted a combined outreach effort, named Checkoff California, with other California nonprofit organizations who receive these contributions. Together, CBCRP and these nonprofit organizations created a social media marketing campaign to alert the public to the income tax checkoff program that included a presence on Facebook, Twitter, and a website highlighting all nonprofit organizations included in the income tax checkoff program.

Governors Arnold Schwarzenegger and Jerry Brown further boosted California's awareness of the opportunity to make donations through the tax checkoff by issuing official proclamations declaring March as Checkoff California Month.

The Community Partners Program has led to growth and diversification in donations to CBCRP. An average of 29,000 individuals annually donated over \$2.1 million to CBCRP during 2010–2015 through the state income tax checkoff program. This made CBCRP one of the checkoff program’s top beneficiary organizations. The grants that were funded in part through voluntary tax contributions can be found in Table 21.

Table 21: Grants funded in part through voluntary tax contributions

Grant Title	Investigator(s)	Institution(s)
Targeting Brain Metastasis with a Cell-based Approach	Mihaela Lorger	The Scripps Research Institute
Light at Night and Breast Cancer Risk in California Teachers	Peggy Reynolds	Cancer Prevention Institute of California
Salivary Biomarkers for Early Detection of Breast Cancer	Lei Zhang	UCLA
Measuring Real-World Breast Cancer Outcomes	Allison Kurian	Stanford University School of Medicine
Combating Breast Cancer with the Welllderly Immune Repertoire	Brunhilde Felding	Scripps Research Institute
Vitamin D and Breast Cancer in Obesity: Therapeutic Trials	David Feldman	Stanford University
Communicating Research Results Effectively to Policy Makers	Joy Melnikow	UC Davis
Decreasing Endocrine Disruptor Exposure in Latina Teens	Kim Harley and Kimberly Parra	UC Berkeley and Clinica de Salud del Valle de Salinas
Co-Targeting the Notch and EphB4 Receptors in Breast Cancer	Debasish Tripathy	University of Southern California
Genetic Predictors of Chemotherapy Toxicity in Breast Cancer	Deanna Kroetz	UCSF
Meeting the self-care needs of Latinas after breast cancer	Anna Napoles and Carmen Ortiz	UCSF and Circulo de Vida Cancer Support and Resource
Vitamin D Signals Via a Novel Pathway to Inhibit Metastasis	Brian Feldman	Stanford University
Intranasal Drug Delivery for Brain Metastatic Breast Cancer	Axel Schonthal	University of Southern California
Targeting Breast Cancer Metastasis to Bone	Christopher Contag	Stanford University
Intervening on Reproductive Health in Young Survivors	Irene Su	UC San Diego
CT-guided DOT for Breast Cancer Imaging	Changqing Li	UC Merced
Gut Microbiota in Association with Chemotherapy Treatment	Anna Wu	University of Southern California
Persistent Organic Pollutants and Mammographic Density	Eunjung Lee	University of Southern California

Foundation and Government Funding

The Avon Foundation for Women contributed \$500,000 to support CBCRP’s Special Research Initiatives. The funds help support a study examining long-term environmental exposures and breast cancer in a large, diverse population group and a study investigating why women from some minority groups, once they are diagnosed with breast cancer, are less likely than others to be successfully treated.

CBCRP also has been successful in securing grant funds from the National Institute for Environmental Health Sciences and the National Cancer Institute for CRIBS (Award number 1RC4ES019826), QuickStart (Award number R25CA188482), and the Symposium (Award

number 1R13 ES022921-01) These projects are described in Section V: Program Highlights 2010–2015.

Community Foundation for Monterey County granted CBCRP \$107,800 through The Anita Tarr Turk Fund for Breast Cancer Research to co-fund an IDEA grant to Mark LaBarge at the Lawrence Berkeley National Laboratory to investigate Mechanical Stressors and Age as Regulators of Telomerase.

Donations from the Public

Californians continue to demonstrate enthusiasm for CBCRP's research. Thanks to many generous individuals, CBCRP received nearly \$600,000 in donations during 2010–2015. Donations can be accepted through the following website:
<http://www.cabreastcancer.org/support-us/>.

The following organizations and businesses also raised funds for CBCRP through events and campaigns: United Way of the Bay Area; Wells Fargo Community Support Campaign; AT&T Employee Giving Campaign; Kaiser Permanente Community Giving Campaign; Spectrum Clubs, Inc.; Lighthouse Quilters Guild; Chevron Humankind Matching Gift Campaign; Amgen Matching Gift Campaign; and Microsoft Matching Gift Campaign, Truist, Truist PWC, and the Silicon Valley Community Foundation.

We also received a generous bequest of \$380,000 from the Katie Ann Buzbee Trust. Details of grants that were funded through this bequest are provided in Table 22.

Table 22: Grants funded all or in part by Katie Ann Buzbee Trust.

Title	Investigator	Institution
Epigenetic changes as modifiers of BRCA1/BRCA2 cancer risk	Susan Neuhausen	Beckman Research Institute at the City of Hope
Predicting BRCA1 mutation carrier status from tumor pathology	Ann Hamilton	University of Southern California
Rescuing HR DNA repair in BRCA1-mutation carriers	Jeremy Stark	Beckman Research Institute at the City of Hope
Getting a jump on cancer with a genomic risk classifier	Robert West	Stanford University
Drug to block double-strand break repair in breast Cancer	Gilbert Chu	Stanford University

Honoring a Pioneer in CBCRP Visibility and Fundraising: The Faith Fancher Research Award

Faith Fancher was a long-time television news anchor and personality with KTVU (Oakland) who waged a very public battle against breast cancer. She also was the founding member of the CBCRP Executive Team, which formed in 2001 to help raise the visibility and fundraising profile of the Program. Faith passed away in October 2003 after a six-year struggle with breast cancer. In Faith's honor, CBCRP created the annual Faith Fancher Research Award. The award is presented each year to a researcher or research team embarking on a CBCRP-funded breast cancer study that reflects the values that Faith held most closely and extends the work that Faith did for all

women facing breast cancer. The recipients of the Faith Fancher Research Award in 2010–2015 are highlighted in Table 23.

Table 23: Recipients of the Faith Fancher Research Award, 2010–2015

Title	Investigator(s)	Institution(s)
Recording Medical Visits for People with Breast Cancer	Jeffrey Belkora and Sara O'Donnell	UCSF and Mendocino Cancer Resource Center
Sister Survivor: Improving Access to Survivorship Care Plan	Kimlin Ashing-Giwa, Kimlin and Carolyn Tapp, Florence Britton and Isis Pickens	City of Hope National Medical Center and Women of Color Breast Cancer Survivors Support Project
Building Mixtec Community Capacity to Address Breast Health	Annette Maxwell and Sandra Young	UCLA and Mixteco/Indigena Community Organizing Project
Is Cost of Beauty Putting Black Women at Risk? IEAAWC Study	Susanne Montgomery and Eudora Mitchell	Loma Linda University and Quinn Community Outreach Corporation
Engaging Underserved Women in Health Research	Galen Joseph and Allyssa Nickell	UCSF and Shanti Project, Inc.

VII. Impact Beyond CBCRP

CBCRP is not the largest breast cancer research funder, but its impact rivals foundations with much larger budgets. Our commitment to researching areas that are largely underfunded, combined with a commitment to support applicable research puts us in the position of influencing international research agendas as well as state and national policy. Below are some highlights of the impacts we have made since 2010.

Impacting Statewide and National Policy

CBCRP's research strategy is designed not only to increase knowledge about breast cancer, but also to influence the research agenda in a way that leads to solutions to decrease the suffering caused by the disease. For example, the process for defining and funding SRIs has served as templates for groups who are plotting the course of national breast cancer research policies. The evidence that the program's efforts are being embraced at the national level is demonstrated by requests to provide testimony and advice to national bodies.

CBCRP helped inform the efforts of the National Academies of Sciences Institute of Medicine in their preparation of the report *Breast Cancer and the Environment: A Life Course Approach* (<http://www.nap.edu/catalog/13263/breast-cancer-and-the-environment-a-life-course-approach>) (commissioned by Susan G. Komen for the Cure) and the Department of Health and Human Services Interagency Breast Cancer & Environmental Research Coordinating Committee (IBCERCC) of the National Institute of Environmental Health Sciences to release *Breast Cancer and the Environment: Prioritizing Prevention* (<https://www.niehs.nih.gov/about/boards/ibcercc/>). In each of these cases, CBCRP was asked to describe innovative initiatives to inform recommendations for federal and national funders.

The following excerpts from the Congressionally-mandated IBCERCC report illustrate the esteem with which CBCRP and its programs are regarded on the federal level:

“The CBCRP is another excellent model of research translation. The program requires that funding applicants place research projects on a “critical path” that leads from “basic concept to a measurable impact.” Research translation was a key priority of this program, which drew from applied research literature to create three critical paths that apply to the disciplines of (1) clinical research; (2) behavior change and supportive services; and (3) other disciplines, including environmental research. The three context-specific versions of the critical path specify that translation efforts be adapted for a variety of audiences and desired outcomes.” Page 8–12

“The CBCRP evaluated research awards focused on community research collaboration and found that involving multiple stakeholders facilitates better dissemination of research findings and more effective communication” Page 8–13

“The SRI has funded multiple research projects that have expanded the body of science in the areas of environmental health and prevention.” Page 8–14

Spurring Nationwide Research Progress

One goal underlying CBCRP's funding strategy is to leverage funds to spur nationwide progress in breast cancer research. CBCRP is part of a much larger research system. The federal government funds breast cancer research through agencies like the National Cancer Institute and the U.S. Department of Defense and Congressionally Directed Medical Research Programs. Nonprofit organizations and for-profit corporations also fund breast cancer research.

Although CBCRP is the largest state funding source specific for breast cancer research, these funds make up only a small part of the funds granted through the larger system. CBCRP tries to influence this larger research system to move in directions that will lead to research breakthroughs. Researchers have applied the findings from their CBCRP-funded investigations to win funding from other organizations to continue their work. In a survey conducted in 2013, 92 investigators who had active grants between 2010 and 2013 reported that they were able to leverage their CBCRP funding into grants from foundations and federal funders. Principal investigators were awarded 28 new grants totaling \$25,354,151, and applied for an additional 18 pending grants to external funders in the amount of \$23,108,305.

Additionally, CBCRP's emphasis on funding innovative ideas that have a high potential for scientific payoff and projects that are designed to translate into practical use in the real world has yielded meaningful results, such as:

- Based on the research conducted by **Jeff Belkora** of **UCSF** and **Sara O'Donnell** of the **Mendocino Cancer Resource Center**, the nationwide Cancer Support Community launched a toll-free hotline called *Open to Options* that provides telephone-based decision support.
- *Life is Precious—Hmong Breast Health Study*, the intervention to increase breast cancer screening among Hmong adults (developed through a CRC award by **Mary Ann Foo** of the **Orange County Asian and Pacific Islander Community Alliance**, **Sora Tanjasiri** of **CSU Fullerton** and **Marjorie Kagawa-Singer** of **UCLA**) was accepted to the NCI's Research-tested Intervention Programs database, a searchable peer-reviewed database of cancer control interventions and program materials and is designed to provide program planners and public health practitioners easy and immediate access to research-tested materials.
- **Reina Haque** of the **Kaiser Foundation Research Institute Kaiser Research** leveraged pilot funding of a study to examine adverse effects of combined tamoxifen and antidepressants on breast cancer recurrence into the highly competitive, hallmark NIH R01 grant that studied the interactions in a cohort of 16,887 women. She found that there was some increased risk in the first year of combined use that dissipated with extended use of tamoxifen.
- **Gertrude Buehring** of **UC Berkeley** has discovered evidence that the Bovine Leukemia Virus, which causes mammary tumors in animals, can be transmitted from cows to humans and that it is present in human blood and tumors. This may reveal one modifiable cause of some breast cancers.
- **Noriyuki Kasahara** while at the **University of Southern California** developed a gene therapy procedure that has been combined with a cellular therapy approach to target metastatic tumors in the brain. The trials of 5-FC delivery are ongoing at UCLA.
- **Sean McAllister** of the **California Pacific Medical Center Research Institute** has identified a component from marijuana that may be effective in treating breast cancer.

- **Stefanie Jeffrey** of **Stanford University** developed and [patented](#) a method for capturing circulating tumor cells, which is a first step in developing blood-based tumor monitoring and detection.
- **Margaret Wrensch** of **UCSF** and **Georgianna Farren** at **Zero Breast Cancer** conducted follow up research to a CBCRP-funded grant that explored why Marin County has elevated breast cancer levels. They found a genetic variant of the Vitamin D receptor that was present in the predominantly white population. This receptor was present in 64 percent of the women at high risk for breast cancer, a significant 1.9 fold difference from the overall population. While further investigation is needed, the study gives hope for the use of Vitamin D supplements to reduce breast cancer risk in some populations.
- **Shiuan Chen** of **City of Hope** developed AroER tri-screen, a chemical screening test that can analyze 16 times as many chemicals as conventional means. Based on the excellent technical and biological performance characteristics of the AroER tri-screen assay, it has been selected for screening in the Tox21 10K compound library for identification of aromatase inhibitors-like EDCs.

The progress listed here is just a sampling of some of the real world impact CBCRP has been able to spark in California and beyond.

VIII. Looking Forward

As CBCRP celebrates more than 20 years of funding innovation in breast cancer research, there is considerable work to be done. Through its ongoing evaluation and strategic planning process, CBCRP has been able to set a path that will continue to advance scientific understanding of the causes, prevention and treatments for the disease. CBCRP's work directly benefits thousands of women and their families across California.

Program-initiated research will provide important new opportunities to address occupational exposures to chemicals, new chemical testing technologies that will better protect women's health, and research that addresses racial disparities. It will create data that can be used to improve policies, resulting in direct improvements in people's lives.

Investigator-initiated research continues to be a way for researchers to develop creative approaches to understanding how breast cancer develops, how to detect it and how to treat the disease. It provides opportunities for communities to engage in the research that they can use to lessen the impact of breast cancer locally.

CBCRP plays a unique role in the field of breast cancer research. In the coming years, CBCRP will continue to support important research that will reduce physical and emotional suffering, as well as the economic burden of the disease.

Appendix 1: California Breast Cancer Research Program Council (2010–2015)

Chairs

Jon Greif (2014–2015)
Naz Sykes (2012–2014)
Teresa Burgess (2011–2012)
Jeanne Rizzo (2010–2011)
Jim Ford (2009–2010)

Vice-Chairs

Sharima Rasanayagam (2014–2015)
Jon Greif (2013–2014)
Teresa Burgess (2012–2013)
Naz Sykes (2011–2012)
Teresa Burgess (2010–2011)
Barbara Brenner (2009–2010)

Advocates

Susan Braun, Commonweal (2009–2012)
Barbara Brenner, J.D., Breast Cancer Action (2008–2010)
Maria Caprio, Shanti Project, Inc. (2013–2015)
Ysabel Duron, Latinas Contra Cancer (2010–2013)
Karren Ganstwig, Los Angeles Breast Cancer Alliance (2007–2010)
Karuna Jaggar, Breast Cancer Action (2012–2015)
Cacilia Kim, J.D., Ph.D., California Women’s Law Center (2010–2013)
Janice Mathurin, West Fresno Health Care Coalition (2013–2016)
Marta Nichols, Breast Cancer Connections (2012–2015)
Sharima Rasanayagam, Ph.D., Breast Cancer Fund (2012–2017)
Jeanne Rizzo, RN, Breast Cancer Fund (2008–2012)
Donna Sanderson, Komen for the Cure (2009–2012)

Scientists/Clinicians

Lisa Barcellos, Ph.D., UC Berkeley (2009–2012)
Moon Chen, Ph.D., UC Davis (2008–2011)
Laura Fenster, Ph.D., California Department of Public Health (2007–2010)
James Ford, M.D., Stanford University School of Medicine (2008–2011)
Cynthia Gomez, Ph.D., San Francisco State University (2011–2014)
Shelley Hwang, M.D. UCSF Comprehensive Cancer Center (2007–2010)
Marjorie Kagawa-Singer, Ph.D., UCLA (2014–2017)
Melanie Marty, Ph.D., Office of Environmental Health Hazard Assessment (2012–2015)
Arash Naeim, M.D., Ph.D., UCLA (2012–2015)
Sora Park Tanjasiri, Dr.PH, M.P.H., California State University, Fullerton (2010–2013)
Kristiina Vuori, M.D., Ph.D., Sanford-Burnham Medical Research Institute (2013–2016)
David Wellisch, Ph.D., UCLA (2013–2016)
Mary Alice Yund, Ph.D. UC Berkeley (2007–2010)

Industry Representatives

Chris Bowden, Ph.D., Genentech (2007–2010)
Teresa Burgess, Ph.D., Amgen, Inc. (2008–2013)
Marjorie Green, M.D., Genentech (2013–2016)
Kathy Kamath Ph.D., Cytom X Therapeutics, LLC (2010–2013)
K. Alice Lueng, Sapientiae (2013–2016)

Medical Specialists

Jon Greif, DO, FACS, Bay Area Breast Surgeons, Inc. (2012–2016)
Michael Moffett, M.D., Cancer Care Associates (2010–2011)
Klaus Porzig, M.D. Stanford Cancer Center (2006–2010)

Nonprofit Health Organization Representatives

Roxanna Bautista, M.P.H., C.H.E.S., Asian & Pacific Islander American Health Forum (2007–2010)
Carlina Hansen, Women’s Community Clinic (2009–2012)
Ted Schettler, M.D., M.P.H., Science and Environmental Health Network (2012–2015)
Naz Sykes, Dr. Susan Love Research Foundation (2010–2015)

Appendix 2: California Breast Cancer Research Program Staff (2010–2015)

Current Program staff

Marion H. E. Kavanaugh-Lynch, M.D., M.P.H. Director

Lyn Dunagan, Project Coordinator

Carmela Lomonaco, Ph.D., Environmental Health & Health Policy Sciences Program Officer

Katherine McKenzie, Ph.D., Clinical and Prevention Sciences Program Officer

Lisa Minniefield, Program Specialist

Senaida Poole, Ph.D., Community Initiatives & Public Health Sciences Program Officer

Former staff between 7/1/2010–6/30/2015

Sharan Campleman, Ph.D., Environmental Health & Health Policy Sciences Program Officer

Mary Daughtry, Administrative Assistant

Brenda Dixon-Coby, Outreach Analyst

Laurence Fitzgerald, Ph.D., Core Funding Program Officer

Eric Noguchi, Senior Media Designer

Catherine Thomsen, M.P.H., Environmental Health & Health Policy Sciences Program Officer

Appendix 3: CBCPI Steering Committee and Strategy Advisors lists

CBCPI Steering Committee

Co-Chairs:

Tracey Woodruff, M.P.H., Ph.D., UCSF

Marion (Mhel) Kavanaugh-Lynch, M.D., M.P.H., California Breast Cancer Research Program

Julia G. Brody, Ph.D., Silent Spring Institute

Richard Clapp, D.Sc., MPH, Boston University School of Public Health

Jeanne Rizzo, R.N., Breast Cancer Fund

Saraswati Sukumar, Ph.D., Johns Hopkins Medical Institute

Beti Thompson, Ph.D., Fred Hutchinson Cancer Research Center

David Williams, Ph.D., Harvard University

Co-investigator:

Marj Plumb, Dr.P.H., Co-Investigator, Plumblin Consulting and Coaching, Inc.

Ex-Officio Members:

Marc Hurlbert, Ph.D., Avon Foundation for Women

Kimberly Sabelko, Susan G. Komen for the Cure

CBCPI Strategy Advisors

Electra D. Paskett, Ph.D., Ohio State University

Jessica Schifano, J.D., M.P.H., U.S. Department of Labor, Occupational Safety & Health Administration

Sarah Gehlert, Ph.D., University of Chicago

George Sawaya, M.D., UCSF

Judy E. Garber, M.D., MPH, Johns Hopkins Medical Institute

Kala Visvanathan, M.B.B.S., FRACP, M.H.S.,

Lisa A. Bero, Ph.D., UCSF

Nsedu Obot Witherspoon, M.P.H., Children's Environmental Health Network

Toshihiro Shioda, M.D., Ph.D., Harvard Medical School

William H. Dow, Ph.D., UC Berkeley

Marjorie Kagawa-Singer, Ph.D., UCLA

Rachel Morello-Frosch, Ph.D., M.P.H., UC Berkeley

Sue Fenton, Ph.D., National Institute of Environmental Health Sciences

Appendix 4: CBCRP 2010–2015 Research Review Committees

Reviewer Role	Reviewer	Title	Affiliation	Location
SRI Environmental Exposure Cohort Review, 2010				
Chair	Suzanne Fenton, Ph.D.	Reproductive Endocrinologist	National Institute of Environmental Health Sciences	Research Triangle Park, NC
Scientific	Julia Brody, Ph.D.	Executive Director	Silent Spring Institute	Newton, MA
	Francine Laden, Sc.D.	Associate Professor of Environmental Epidemiology	Harvard University School of Public Health	Boston, MA
	Stephanie Robert, Ph.D.	Professor and Director of Doctoral Studies	University of Wisconsin-Madison	Madison, WI
	John Vena, Ph.D.	UGA Foundation Professor & Department Head	University of Georgia	Athens, GA
Advocate	Ann Hernick	President	Breast Cancer Alliance of Greater Cincinnati	Cincinnati, OH
SRI Partnership Review 2010				
Chair	Julia Brody, Ph.D.	Executive Director	Silent Spring Institute	Newton, MA
Scientific	Sarah Gehlert, Ph.D.	E. Desmond Lee Professor of Racial and Ethnic Diversity	Washington University	St. Louis, MO
	Sandra Steingraber, Ph.D.	Distinguished Visiting Scholar	Ithaca College	Ithaca, NY
Community Impact 2011				
Chair	Shiraz Mishra, M.B.B.S., Ph.D	Professor	University of New Mexico	Albuquerque, NM
Scientific	Sherrie Flynt Wallington, Ph.D.	Asst. Prof. of Oncology; Prog. Dir., Health Disparities	Georgetown University	Washington, DC
	Elmer Freeman, M.S.W.	Executive Director	Center for Community Health Education Research and Services	Boston, MA
	Carolyn Gotay, Ph.D.	Prof. & Can. Cancer Soc. Chair in Cancer Primary Prev.	University of British Columbia	Vancouver, BC
	Kathryn Kash, Ph.D.	Owner	KM Behavioral Consulting LLC	Spring Hill, FL
	Reginald Tucker-Seeley, ScD	Assistant Professor of Social and Behavioral Sciences	Harvard University School of Public Health	Boston, MA
	Mayumi Willgerodt, Ph.D.	Associate Professor	University of Washington	Seattle, WA
Advocate	Beverly Canin	Advocate	Breast Cancer Option, Inc	Rhinebeck, NY
	Susan Pelletier	Advocate	Vermont Breast Cancer Coalition	Stockbridge, VT
Ad Hoc	Ellyn Matthews, PhD, RN, AOCN	Assistant Professor	University of Colorado, Denver	Aurora, CO
	Susan Schneider, PhD, RN, AOCN®, FAAN	Associate Professor, Lead Faculty Onc Nursing Specialty	Duke University Medical Center	Durham, NC
Advocate Observers	Nancy Bellen Connie Engel, MA	Advocate Program Coordinator	No affiliation Breast Cancer Fund	Santa Rosa, CA San Francisco, CA

Etiology & Prevention 2011				
Chair	Kirsten Moysich, Ph.D.	Prof. of Oncology, Prog Chair, Cancer Pathology & Prev.	Roswell Park Cancer Institute	Buffalo, NY
Scientific	Stefan Ambs, Ph.D.	Principal Investigator	National Cancer Institute	Bethesda, MD
	Leena Hilakivi-Clarke, Ph.D. Chi-Chen Hong, Ph.D.	Associate Professor, Oncology Assistant Professor	Georgetown University Roswell Park Cancer Institute	Washington, DC Buffalo, NY
Advocate	Ann Fonfa, BPS Sara William	Founder and President Advocate	The Annie Appleseed Project The Carolina Breast Cancer Study (UNC)	Delray Beach, FL Mebane, NC
Ad Hoc	David Euhus, M.D.	Professor, Marilyn R Corrigan Distinguished Chair	University of Texas, Southwestern Medical Center	Dallas, TX
	Francine Laden, Sc.D.	Associate Professor of Environmental Epidemiology	Harvard University School of Public Health	Boston, MA
Advocate Observer	Mary Aalto	Advocate	USC Norris Cancer Survivorship Advisory Council	Studio City, CA
Treatment, Detection & Prognosis 2011				
Chair	Mark Pegram, M.D.	Professor of Medicine	University of Florida	Miami, FL
Scientific	Benjamin Anderson, M.D.	Professor	University of Washington	Seattle, WA
	Ralph Bernacki, Ph.D.	Professor; Cancer Research Scientist	Roswell Park Cancer Institute	Buffalo, NY
	Ulrich Bierbach, Ph.D.	Associate Professor	Wake Forest University	Winston-Salem, NC
	Sandra Demaria, M.D.	Assistant Professor	NYU Langone Medical Center	New York, NY
	Kristine Glunde, Ph.D.	Associate Professor of Radiology and Oncology	Johns Hopkins University	Baltimore, MD
	Eldon Jupe, Ph.D.	Vice President, Clinical Laboratory Director	InterGenetics, Incorporated	Oklahoma City, OK
	Paul Kinahan, Ph.D.	Professor of Radiology	University of Washington	Seattle, WA
	William Redmond, Ph.D.	Assistant Professor	Earle A. Chiles Research Institute	Portland, OR
	Fredika Robertson, Ph.D.	Executive Director, Clinical Research Sciences	Virginia Commonwealth University	Richmond, VA
	Ratna Vadlamudi, Ph.D.	Professor	University of Texas at San Antonio	San Antonio, TX
Martin Woodle, Ph.D.	Scientist & CSO	Aparna Biosciences Corp.	Bethesda, MD	
Advocate	Roberta Gelb	Advocate	SHARE	New York, NY
	Nancy Key	Advocate	Susan G. Komen Foundation	Camano Island, WA
	Kimberly Newman- McCown	Advocate	VWR International, LLC	Radnor, PA
	Beverly Parker, Ph.D.	Advocate	Breast Cancer Network of Strength	Naperville, IL
Ad Hoc	David Mankoff, M.D., Ph.D.	Associate Professor of Radiology	University of Washington Medical Center	Seattle, WA
	Silvia Formenti, M.D.	Professor of Medicine	New York University Medical Center	New York, NY
	Matthew Rowling, Ph.D.	Assistant Professor	Iowa State University	Ames, IA
	John Ward, M.D.	Professor and Chief	University of Utah	Salt Lake City, UT
Advocate Observer	Karuna Jaggar	Executive Director	Breast Cancer Action	San Francisco, CA

Tumor Biology 2011				
Chair	Harikrishna Nakshatri, BVSc (DVM), Ph.D.	Marian J. Morrison Professor of Breast Cancer Research	Indiana University-Purdue University, Indianapolis	Indianapolis, IN
Scientific	Hava Avraham, Ph.D.	Associate Professor of Medicine	Beth Israel Deaconess Medical Center	Boston, MA
	Qihong Huang, M.D., Ph.D.	Associate Professor	The Wistar Institute	Philadelphia, PA
	Julie Lang, M.D.	Principal Investigator	Arizona Health Sciences Center	Tucson, AZ
	Joan Lewis-Wambi, Ph.D.	Assistant Professor	Fox Chase Cancer Center	Philadelphia, PA
	Cindy Miranti, Ph.D.	Scientific Investigator	Van Andel Research Institute	Grand Rapids, MI
	Patricia Schoenlein, Ph.D.	Associate Professor	Medical College of Georgia	Augusta, GA
	Joyce Schroeder, Ph.D.	Associate Professor	University of Arizona	Tucson, AZ
Advocate	Valerie Fraser	Advocate	Inflammatory Breast Cancer Research Foundation	Huntington Woods, MI
	Theresa Martyka	Advocate	Breast Cancer Network of Strength	Chicago Ridge, IL
	Nancy Singleton	Patient Navigator	SHARE	Hoboken, NJ
Ad Hoc	James Kaput, Ph.D.	Postgraduate Researcher	UC Davis	Davis, CA
	Thomas Ludwig, Ph.D.	Associate Professor	Columbia University	New York, NY
Advocate Observer	Chira Chen-Tanyolac	UCSF Breast Cancer SPORE Advocate	UCSF	San Francisco, CA
SRI Chemicals Testing 2011				
Chair	Vincent Cogliano, Ph.D.	Acting Director, Integrated Risk Information System	United States Environmental Protection Agency	Washington, DC
Scientific	Stephen Barnes, Ph.D.	Professor	University of Alabama	Birmingham, AL
	Billy Day, Ph.D.	Professor and Director, Proteomics Core Lab	University of Pittsburgh	Pittsburgh, PA
	Karam El-Bayoumy, Ph.D.	Distinguished Professor & Assoc. Dir. of Basic Research	Pennsylvania State University	Hershey, PA
	Jean Latimer, Ph.D.	Associate Professor of Pharmaceutical Sciences	University of Pittsburgh	Pittsburgh, PA
	Mary Beth Martin, Ph.D.	Professor	Georgetown University	Washington, DC
Advocate	Anna Cluxton, MBA	Advocate	Young Survival Coalition	Columbus, OH
SRI Immigration Review 2011				
Chair	Sarah Gehlert, Ph.D.	E. Desmond Lee Professor of Racial and Ethnic Diversity	Washington University	St. Louis, MO
Scientific	Francesca Gany, MD, MS	Director, Center for Immigrant Health	New York University School of Medicine	New York, NY
	Shiraz Mishra, M.B.B.S., Ph.D.	Professor	University of New Mexico	Albuquerque, NM
	Dorothy Pathak, Ph.D., MS	Professor	Michigan State University	East Lansing, MI
Advocate	JoAnn Tsark, MPH	Research Director	Papa Ola Lokahi	Honolulu, HI
Ad Hoc	Patricia Thompson Carino, Ph.D.	Professor, Dept. of Pathology Assoc Dir. for Basic Res.	State University of New York at Stony Brook	Stony Brook, NY

Community Impact 2012				
Chair	Carolyn Gotay, Ph.D.	Prof. & Can. Cancer Soc. Chair in Cancer Primary Prev.	University of British Columbia	Vancouver, BC
Scientific	Sherrie Flynt Wallington, Ph.D.	Asst. Prof. of Oncology; Program Director, Health Disparities	Georgetown University	Washington, DC
	Anna Hoover, Kathryn Kash, Ph.D.	Deputy Director Owner	University of Kentucky KM Behavioral Consulting LLC	Lexington, KY Spring Hill, FL
Advocate	Susan Pelletier	Advocate	Vermont Breast Cancer Coalition	Stockbridge, VT
Ad Hoc	Rachel Ceballos, PhD	Assistant Professor	Fred Hutchinson Cancer Research Center	Seattle, WA
Advocate Observer	JoAnn Loulan, M.A., M.F.T.	Advocate	Breast Cancer Action	Portola Valley, CA
Etiology, Prevention & Biology 2012				
Chairs	Kirsten Moysich, Ph.D.	Professor of Oncology, Program Chair, Cancer Pathology & Prevention	Roswell Park Cancer Institute	Buffalo, NY
	Harikrishna Nakshatri, BVSc (DVM), Ph.D.	Marian J. Morrison Professor of Breast Cancer Research	Indiana University-Purdue University, Indianapolis	Indianapolis, IN
Scientific	Alexander Bishop, D.Phil.	Associate Professor Cellular and Structural Biology	University of Texas at San Antonio	San Antonio, TX
	Charles Clevenger, M.D., Ph.D.	Professor of Pathology	Northwestern University	Chicago, IL
	Suzanne Fenton, Ph.D.	Reproductive Endocrinologist	National Institute of Environmental Health Sciences	Research Triangle Park, NC
	Chi-Chen Hong, Ph.D.	Assistant Professor	Roswell Park Cancer Institute	Buffalo, NY
	Qihong Huang, M.D., Ph.D.	Associate Professor	The Wistar Institute	Philadelphia, PA
	Roxana Moslehi, Ph.D.	Assistant Professor	State University of New York at Albany	Rensselaer, NY
Advocate	Joyce Schroeder, Ph.D.	Associate Professor	University of Arizona	Tucson, AZ
	Wade Welshons, Ph.D.	Associate Professor	University of Missouri	Columbia, MO
	Theresa Martyka, Carrie Wells, Madeleine Tress, Ph.D.	Advocate Advocate Advocate	Y-ME National Breast Cancer Organization Survivors' Retreat SHARE	Chicago Ridge, IL Baltimore, MD New York, NY
Advocate Observer	Hannah Klein Connolly	UCSF SPORE breast cancer advocate	UCSF Spore Core	Burlingame, CA
Treatment & Detection 2012				
Chair	Fredika Robertson, Ph.D.	Executive Director, Clinical Research Sciences	Virginia Commonwealth University	Richmond, VA
Scientific	Joanna Burdette, Ph.D.	Associate Professor	University of Illinois at Chicago	Chicago, IL
	Eldon Jupe, Ph.D.	Vice President, Clinical Laboratory Director	InterGenetics, Incorporated	Oklahoma City, OK
	Julie Lang, M.D.	Principal Investigator	Arizona Health Science Center	Tucson, AZ
	William Redmond, Ph.D.	Assistant Professor	Earle A. Chiles Research Insitute	Portland, OR

Treatment & Detection 2012 (continued)				
Scientific	Edward Sauter, M.D., Ph.D.	Director, Cancer Treatment and Prevention Center	University of Texas at Tyler	Tyler, TX
	Natalie Serkova, Ph.D.	Director, Colorado Cancer Imaging Core	University of Colorado	Aurora, CO
	Eva Marie Sevick, Ph.D.	Professor and Director	University of Texas	Houston, TX
	Ratna Vadlamudi, Ph.D.	Professor	University of Texas at San Antonio	San Antonio, TX
	Martin Woodle, Ph.D.	Scientist & CSO	Aparna Biosciences Corp.	Bethesda, MD
Advocate	David Bake	Advocate	National Breast Cancer Coalition	Bellaire, TX
	Valerie Fraser	Advocate	Michigan Breast Cancer Coalition	Huntington Woods, MI
	Nancy Key	Advocate	Susan G. Komen Foundation	Camano Island, WA
	Debra Madden	Advocate	National Breast Cancer Coalition	Newtown, CT
Advocate Observer	Sharima Rasanayagam, Ph.D.	Director of Science	Breast Cancer Fund	San Francisco, CA
Clinical, Prevention & Biological Sciences 2013				
Chairs	Harikrishna Nakshatri, BVSc (DVM), Ph.D.	Marian J. Morrison Professor of Breast Cancer Research	Indiana University-Purdue University, Indianapolis	Indianapolis, IN
	Fredika Robertson, Ph.D.	Executive Director, Clinical Research Sciences	Virginia Commonwealth University	Richmond, VA
Scientific	Alexander Bishop, D.Phil.	Associate Professor Cellular and Structural Biology	University of Texas at San Antonio	San Antonio, TX
	Joanna Burdette, Ph.D.	Associate Professor	University of Illinois at Chicago	Chicago, IL
	Chi-Chen Hong, Ph.D.	Assistant Professor	Roswell Park Cancer Institute	Buffalo, NY
	Shelley Hwang, M.D., MPH	Professor of Surgery	Duke University	Durham, NC
	Cheryl Jorcyk, Ph.D.	Professor	Boise State University	Boise, ID
	Eldon Jupe, Ph.D.	Vice President, Clinical Laboratory Director	InterGenetics, Incorporated	Oklahoma City, OK
	Roxana Moslehi, Ph.D.	Assistant Professor	State University of New York at Albany	Rensselaer, NY
	William Redmond, Ph.D.	Assistant Professor	Earle A. Chiles Research Insitute	Portland, OR
	Carol Sartorius, Ph.D.	Associate Professor of Pathology	University of Colorado	Aurora, CO
	Edward Sauter, M.D., Ph.D.	Director, Cancer Treatment and Prevention Center	University of Texas at Tyler	Tyler, TX
	Natalie Serkova, Ph.D.	Director, Colorado Cancer Imaging Core	University of Colorado	Aurora, CO
	Steven Swanson, Ph.D.	Professor of Pharmacognosy	University of Illinois at Chicago	Chicago, IL
	Ratna Vadlamudi, Ph.D.	Professor	University of Texas at San Antonio	San Antonio, TX
	Martin Woodle, Ph.D.	Scientist & CSO	Aparna Biosciences Corp.	Bethesda, MD
Advocate	Brenda Bryan	Advocate	The Virginia Breast Cancer Foundation	Arlington, VA
	Lisa DeFerrari, M.B.A.	Advocate	The Virginia Breast Cancer Foundation	Henrico, VA

Clinical, Prevention & Biological Sciences 2013 (continued)				
Advocate	Barbara Holtz, MBA	Advocate	Dana-Farber Cancer Institute	Wayland, MA
	Eunice Hostetter	Advocate	Susan G. Komen Foundation	Kirkland, WA
	Beverly Parker, Ph.D.	Advocate	Breast Cancer Network of Strength	Naperville, IL
Ad Hoc	John Ward, M.D.	Professor and Chief	University of Utah	Salt Lake City, UT
Advocate Observer	Karen Weixel	Patient Navigator	UCSF Carol Franc Buck Breast Care Center	Walnut Creek, CA
Community Impact 2013				
Chair	Carolyn Gotay, Ph.D.	Prof. & Can. Cancer Soc. Chair in Cancer Primary Prev.	University of British Columbia	Vancouver, BC
Scientific	Sandra Halverson, MPH, PhD	Adjunct Assistant Professor of Medicine	Vanderbilt University	Durham, NC
	Kathryn Kash, Ph.D.	Owner	KM Behavioral Consulting LLC	Spring Hill, FL
	Patricia O'Brien,	Assistant Professor	University of Vermont	Burlington, VT
	Victoria Seewaldt, M.D.	Associate Professor of Medicine	Duke University	Durham, NC
	Beti Thompson, Ph.D.	Professor	Fred Hutchinson Cancer Research Center	Seattle, WA
	Tom Webster, DSc	Professor	Boston University	Boston, MA
	Armin Weinberg, Ph.D.	COE	Life Beyond Cancer Foundation	Houston, TX
	Sacoby Wilson, Ph.D., M.S.	Assistant Professor	University of Maryland	College Park, MD
Advocate	Christine Carpenter,	President	Iowa Breast Cancer Education Action	Cedar Falls, IA
	Venus Gines, M.A.	CEO/Founder	Dia de la Mujer Latina	Pearland, TX
	Marion Morra, D.Sc.	President	Morra Communications	Milford, CT
Advocate Observer	Jamie Ledezma, Esq.	Central California Regional Director	Cancer Legal Resource Center	San Diego, CA
CBCPI Paradigm 2014				
Chair	Sarah Gehlert, Ph.D.	E. Desmond Lee Professor of Racial and Ethnic Diversity	Washington University	St. Louis, MO
Scientific	Anthony Gatrell, Ph.D.	Dean of the School of Health and Medicine	Lancaster University	Lancaster,
	Julie Goodman, Ph.D., DABT, FACE	Principal	Gradient	Cambridge, MA
Advocate	Vernal Branch	Patient Research Advocate	Cancer Action Coalition of Virginia	Richmond, VA
Chemicals Testing and Occupational Exposures 2014				
Chair	Vincent Cogliano, Ph.D.	Acting Director, Integrated Risk Information System	United States Environmental Protection Agency	Washington, DC
Scientific	Dana Boyd Barr, Ph.D.	Research Professor	Emory University	Atlanta, GA
	Julie Goodman, Ph.D., DABT, FACE	Principal	Gradient	Cambridge, MA
	Stephen Grant, Ph.D.	Associate Professor	NOVA Southeastern University	Pittsburgh, PA
	Mary Beth Martin, Ph.D.	Professor	Georgetown University	Washington, DC

Chemicals Testing and Occupational Exposures 2014 (continued)				
Scientific	Kristine Thayer, Ph.D.	Director, Office of Health Assessment and Translation	National Institute of Environmental Health Sciences	Research Triangle Park, NC
	Guangdi Wang, Ph.D.	Professor of Chemistry	Xavier University	New Orleans, LA
Advocate	Lisa DeFerrari, M.B.A.	Advocate	The Virginia Breast Cancer Foundation	Henrico, VA
	Ann Fonfa, BPS	Founder and President	The Annie Appleseed Project	Delray Beach, FL
Clinical, Prevention, & Biological Sciences 2014				
Chairs	Leena Hilakivi-Clarke, Ph.D.	Associate Professor, Oncology	Georgetown University	Washington, DC
	Fredika Robertson, Ph.D.	Executive Director, Clinical Research Sciences	Virginia Commonwealth University	Richmond, VA
Scientific	Stefan Ambs, Ph.D.	Principal Investigator	National Cancer Institute	Bethesda, MD
	Alexander Bishop, D.Phil.	Associate Professor Cellular and Structural Biology	University of Texas at San Antonio	San Antonio, TX
	Abenaa Brewster, M.D., M.H.S.	Associate Professor of Medicine	M.D. Anderson Cancer Center	Houston, TX
	Joanna Burdette, Ph.D.	Associate Professor	University of Illinois at Chicago	Chicago, IL
	Suzanne Fenton, Ph.D.	Reproductive Endocrinologist	National Institute of Environmental Health Sciences	Research Triangle Park, NC
	Qihong Huang, M.D., Ph.D.	Associate Professor	The Wistar Institute	Philadelphia, PA
	Shelley Hwang, M.D., MPH	Professor of Surgery	Duke University	Durham, NC
	Cheryl Jorcyk, Ph.D.	Professor	Boise State University	Boise, ID
	Peter Kabos, MD	Assistant Professor	University of Colorado, Denver	Aurora, CO
	Edward Sauter, M.D., Ph.D.	Director, Cancer Treatment and Prevention Center	University of Texas at Tyler	Tyler, TX
	Natalie Serkova, Ph.D.	Director, Colorado Cancer Imaging Core	University of Colorado	Aurora, CO
	Eva Marie Sevcik, Ph.D.	Professor and Director	University of Texas	Houston, TX
	Steven Swanson, Ph.D.	Professor of Pharmacognosy	University of Illinois at Chicago	Chicago, IL
Advocate	Lisa DeFerrari, M.B.A.	Advocate	The Virginia Breast Cancer Foundation	Henrico, VA
	Eunice Hostetter	Advocate	Susan G. Komen Foundation	Kirkland, WA
	Kimberly Newman-McCown	Advocate	VWR International, LLC	Radnor, PA
	Madeleine Tress, Ph.D.	Advocate	SHARE	New York, NY
	Mary Whitehead	Advocate	National Breast Cancer Coalition	Sharon, CT
Advocate Observer	Shirley Brown	Advocate	Women of Color Breast Cancer Survivor's Support	Los Angeles, CA
Community Impact 2014				
Chair	Carolyn Gotay, Ph.D.	Prof. & Can. Cancer Soc. Chair in Cancer Primary Prev.	University of British Columbia	Vancouver, BC
Scientific	Sherrie Flynt Wallington, Ph.D.	Asst. Prof. of Oncology; Prog. Dir., Health Disparities	Georgetown University	Washington, DC

Community Impact 2014 (continued)				
Scientific	Sandra Halverson, MPH, PhD	Adjunct Assistant Professor of Medicine	Vanderbilt University	Durham, NC
	Shiraz Mishra, M.B.B.S., Ph.D	Professor	University of New Mexico	Albuquerque, NM
	Beti Thompson, Ph.D.	Professor	Fred Hutchinson Cancer Research Center	Seattle, WA
	Reginald Tucker-Seeley, ScD	Assistant Professor of Social and Behavioral Sciences	Harvard University School of Public Health	Boston, MA
Advocate	Beverly Canin	Advocate	Breast Cancer Option, Inc	Rhinebeck, NY
	Patricia O'Brien	Assistant Professor	University of Vermont	Burlington, VT
Advocate Observer	Maija Witte, MPH	Advocate	Breast Cancer Fund	San Francisco, CA
Clinical, Prevention and Biological Sciences 2015				
Chairs	Leena Hilakivi-Clarke, Ph.D.	Associate Professor, Oncology	Georgetown University	Washington, DC
	Fredika Robertson, Ph.D.	Executive Director, Clinical Research Sciences	Virginia Commonwealth University	Richmond, VA
Scientific	Qihong Huang, M.D., Ph.D.	Associate Professor	The Wistar Institute	Philadelphia, PA
	Shelley Hwang, M.D., MPH	Professor of Surgery	Duke University	Durham, NC
	Cheryl Jorcyk, Ph.D.	Professor	Boise State University	Boise, ID
	Peter Kabos, MD	Assistant Professor	University of Colorado, Denver	Aurora, CO
	Lina Mu, M.D., Ph.D.	Associate Professor	State University of New York at Buffalo	New York, NY
	Jose Russo, M.D.	Professor	Fox Chase Cancer Center	Philadelphia, PA
	Edward Sauter, M.D., Ph.D.	Director, Cancer Treatment and Prevention Center	University of Texas at Tyler	Tyler, TX
	Natalie Serkova, Ph.D.	Director, Colorado Cancer Imaging Core	University of Colorado	Aurora, CO
	Eva Marie Sevick, Ph.D.	Professor and Director	University of Texas	Houston, TX
	Patricia Thompson Carino, Ph.D.	Professor, Dept. of Pathology Assoc Dir. for Basic Res.	State University of New York at Stony Brook	Stony Brook, NY
	Douglas Yee, M.D.	Professor of Medicine and Pharmacology	University of Minnesota	Minneapolis, MN
	Siyuan Zhang, M.D., Ph.D.	Nancy Dee Assistant Professor	University of Notre Dame	Notre Dame, IN
	Advocate	Lisa DeFerrari, M.B.A.	Advocate	The Virginia Breast Cancer Foundation
Valerie Fraser		Advocate	Michigan Breast Cancer Coalition	Huntington Woods, MI
Eunice Hostetter		Advocate	Susan G. Komen Foundation	Kirkland, WA
Kimberly Newman-McCown		Advocate	VWR International, LLC	Radnor, PA
Carrie Wells		Advocate	Survivors' Retreat	Baltimore, MD
Ad Hoc	Gloria Bachmann, M.D., M.M.S.	Professor, Int. Chair, Assoc. Dean for Women's Health	Robert Wood Johnson Foundation	New Brunswick, NJ
	Ralf Landgraf, Ph.D.	Associate Professor	University of Miami	Miami, FL
Advocate Observer	Eveline Chang, M.S.W.	Manager of Program Development	Women's Cancer Resource Center	Oakland, CA

Occupational Chemical Exposures in California and Breast Cancer Risk Invitation-only Review				
Scientific	Francine Laden, Sc.D.	Associate Professor of Environmental Epidemiology	Harvard University School of Public Health	Boston, MA
	Susan Pinney, Ph.D.	Professor of Epidemiology	University of Cincinnati College of Medicine	Cincinnati, OH
	Jessica Schifano, J.D., M.P.H.	Health Scientist	U.S. Department of Labor, Occupational Safety & Health Administration	Washington, DC
Advocate	Beverly Canin	Advocate	Breast Cancer Option, Inc	Rhinebeck, NY
Policy Initiative 'Policy Teams' Request for Qualifications				
Chair	Diana Petitti, M.D.,M.P.H.	Adjunct Professor	Arizona State University	Phoenix, AZ
Scientific	Sally McCarty, M.A.	Senior Research Fellow	Georgetown University Health Policy Institute	Indianapolis, IN
	Joel Tickner, Sc.D.	Associate Professor	University of Massachusetts Lowell	Lowell, MA
Advocate	Christine Carpenter	President	Iowa Breast Cancer Education	Cedar Falls, IA

Appendix 5: Policy Research Advocacy Group

Garen Corbett, M.S., University of California Office of the President
Angela Gilliard, J.D., University of California Office of the President
Citseko Staples Miller, American Cancer Society Cancer Action Network
Diane Griffiths, Office of Senator Rober M. Hertzberg
Usha Ranji, M.S., Kaiser Family Foundation
Nancy Buermeyer, The Breast Cancer Fund
Karren Ganstwig, Los Angeles Breast Cancer Alliance
Michael Lipsett, CA Department of Public Health, retired