

## Teachers and Breast Cancer: Understanding the Knowledge and Perceptions of a Population at Risk

*Collaborative research project involving BCERF, Cornell's Department of Communication, and the National Education Association presents some results at the Society for Risk Analysis annual meeting*

**Carmi Orenstein, M.P.H., Editor**

*In 2003, Cornell University's Department of Communication, in collaboration with BCERF and the National Education Association (NEA), received a three-year grant from the Cooperative State Research, Education and Extension Service of the US Department of Agriculture, to research New York State (NYS) teachers' knowledge and perceptions of breast cancer risk. Carmi Orenstein serves as Project Coordinator for the study, under the direction of Cornell Department of Communication faculty members, Drs. Bruce Lewenstein and Cliff Scherer. The New York State Departments of Health and Environmental Conservation provide additional funding to support Carmi's work. Cornell student researchers working on this project include: Sukriti Issar (currently of Brown University), Santhi Gollapalli, Zheng Yang, and Cecilia Lum.*

### **Teachers and breast cancer: what do we know?**

Over 25 studies in the US and internationally have documented the increased incidence of breast (and

some other) cancers amongst teachers. Teachers represent just over four percent of the US workforce, and almost 75 percent of teachers are female. California's Department of Health Services has initiated a study of 133,000 current and retired teachers and administrators to better understand the increased rates they identified in their state for invasive breast (Risk Ratio = 1.51), in situ breast (RR = 1.67), endometrial (RR = 1.72) and ovarian (RR = 1.28) cancers.

The California Teachers Study (CTS), as described in its most recent outreach newsletter (<http://calteachersstudy.org/newsletter.html>), asks teachers "questions about their lifestyles, exposures, and health, and, over time, (looks) for significant relationships between those factors." Using periodic surveys, as well as other techniques such as geographic information systems (GIS) and genetic samples from a sub-group of the study population, the CTS has the potential to advance our understanding of risk factors for this population, as well as the population in general. See [calteachersstudy.org](http://calteachersstudy.org) for studies

published to date on California teachers and breast cancer risk.

### **Why study teachers' knowledge and perceptions of breast cancer risk?**

It will still be many years until the risk factors for breast cancer for teachers, as well as for the general population, are better understood. In fact, many of the studies published to date by the CTS have not shown clear relationships between the specific factor under study and breast cancer risk – this is the case with its studies on residential proximity to pesticide use, second-hand smoke exposure, and recent diet. These factors remain controversial with regard to their impact on breast cancer risk. Other CTS studies have provided additional support for a relationship, such as between alcohol consumption and breast cancer risk. Much of the information available to women, whether they actively seek it out or simply hear various fragments by chance, remains indeterminate. There is also the issue of women's exposure to misinformation on the risks for breast cancer.

*continued on page 2*

## index

Research  
Commentary:  
Induced Abortion is  
Not Associated  
with Breast Cancer  
Risk • 4

News from  
the Web • 6

Credible Health  
Information  
on the Web • 7

As health educators and scholars of science and risk communication, the Cornell members of the study team were interested in how an at-risk population such as this deals with scientific uncertainty and possibly confusing health risk-related messages in an area so presumably relevant to them. We were interested in a communications study that would help describe what teachers knew and felt about breast cancer risk, and the role of social networks and other external influences in processing those understandings and perceptions. Ultimately, it is only by having this kind of data about a target population that a health risk information intervention can be effective. When we approached the NEA as potential study partners, their profound concern for their membership's information needs and health was apparent, and they agreed to participate.

### **What kinds of other research are relevant to this study?**

While breast cancer knowledge and risk perception have not previously been studied in a population of teachers, our study builds on research in other populations. Much of the existing breast cancer risk perception research has focused on understanding women's predisposition toward a specific activity, for example, mammography screening or genetic counseling.

A more broadly conceptualized study in this area (Robertson, 2000) identified four key themes in women's accounts of breast cancer risk: cancer as a constant underlying concern, uncertainty in an area of emerging science, a feeling of individual responsibility with limited personal control, and the need to manage individual risk at the collective level. These themes have turned out to resonate well with many of our findings to date.

Other relevant areas of research include that of Trumbo and McComas (2003), and McComas and Trumbo (2001), who have examined how people process information and how they subsequently perceive risk in

suspected cancer clusters. Their work suggests that credibility of information sources plays a key role in increasing or lowering perceived risk. Other factors are also likely to influence how information flows, changes, and is incorporated into the knowledge structures within work-related social networks. Dr. Cliff Scherer, a principal investigator on our study, has worked with a "social network contagion" theory of risk perception (Scherer and Cho, 2003). This theory suggests that social linkages – such as those shared by a community of teachers – play an important role in focusing risk perceptions.

There are other related areas of research, beyond the scope of this article, found largely in the areas of health education and risk communication. Robertson mentions several in her article; for example those which look at lay perceptions of environmental health risks, and differences between lay and "expert" concepts of risk. The Society for Risk Analysis (SRA), an interdisciplinary professional organization devoted to risk assessment, risk management, and risk communication, proved to be an appropriate venue for presenting some of our project's results this past year (more on this below).

### **Cornell Teachers Study activities to date**

In the first year of our study, we conducted focus groups with NEA/New York teachers and education support professionals (ESPs). (ESPs are other school employees belonging to the NEA, such as teacher's assistants, some types of school therapists, nurses and some administrative

professionals.) Our research suggested that teachers' and ESPs' general perceptions of cancer and environmental risk are similar to that of other groups of women, including a tendency to emphasize personal responsibility. But the elevated risk, unique exposures, close social environment at work, and special community roles perceived by these educators presented important distinctions. Study participants described their perceptions against a backdrop of "critical incidents" – memorable local and regional environmental and health events – that had made a large impression on them. We presented these results at the 2004 Annual Meeting of the American Public Health Association.

We wanted to study these perceptions and tendencies in further detail in the second year. We designed, pre-tested, and administered – with the help of forty NEA/NY volunteer "recruiters" – a broader survey to test the frequency and distribution of the initial findings. The questionnaire included attention to: perceived risk of cancer (for the individual and specific groups); perceived control over risk (personal and environmental); perceptions about and trust in the science linking cancer and environmental risk; information sources; individual versus societal responsibility for personal and group risk reduction; self-efficacy related to risk reduction (individual and collective); and, ties to social networks in the occupational and other settings.

We had a 70 percent response rate for this detailed questionnaire, which we distributed to 1,600 NEA/NY teachers and ESPs. This all-female sample had an average age of

### **Within the SRA: Risk Communication**

The Risk Communication Specialty Group (RCSG) focuses on the communication of risk information between technical and lay audiences. Membership represents a variety of theoretical and practical perspectives on risk communication. Members' interest areas include the perception of risk, public participation, mass media coverage of risk, trust and credibility, social influence, and evaluation related to risk communication activities. See: <http://www.sra.org/rcsg/>

45.3 years, and was composed of 63% teachers and 35% ESPs.

### **Cornell group presents at SRA**

The Cornell group presented two papers on our second-year research at the 25th Annual Meeting of the SRA in December 2005. The papers were:

- **Perceptions of Risk Factors for Breast Cancer: The Case of NYS Teachers**, presented by Santhi Gollapalli
- **Predicting Place-Based Enviro-Health Concern: The Case of NYS Teachers**, presented by Sukriti Issar

(Note: the titles of these papers were changed after initial submission of abstracts to the SRA, to better reflect our analyses and results.) This overview only briefly describes the research questions and general results of the SRA presentations; please watch *The Ribbon* for announcements of other presentations and publications.

**Perceptions of Risk Factors for Breast Cancer: The Case of NYS Teachers.** The primary research question in this analysis was: what predicts the attribution of environmental risk factors for breast cancer in this population? In the survey, we asked respondents an open-ended question: “what are the most important things for increasing the risk for developing breast cancer?” We analyzed the results in terms of county of residence, other environmental health concerns, perceived risk of breast cancer for various groups, information sources, and other variables. We found that the attribution of environmental factors to breast cancer risk seems to be related to concern about the environment in the community and school building environments, as well as to attributions of responsibility for risk reduction. Our findings enable us to theorize a model of environmental attributions, in which a constellation of beliefs amongst many of the teachers takes shape. We were also able to develop a comparative model


that looks at reproductive risk factor attribution.

**Predicting Place-Based Enviro-Health Concern: The Case of NYS Teachers.** In this analysis we sought information on the ability of certain individual, social and place-based factors in predicting what we have termed, “place-based enviro-health concern.” This measure is a composite of seven potential community environmental health concerns. Factors that turned out to be predictors of place-based enviro-health concern included various aspects of community involvement – such as a greater history of talk with family and friends about breast cancer diagnoses as well as participation in various organizations, ecological attitudes, and experience with certain environmental conditions. These predictors, as well as those factors that did not turn out to be predictors in our analysis – such as age, years in the community, or local media use – have implications for developing more context-specific environmental health risk communications.

The Cornell research was very well received at the SRA meeting, and project researchers were able to continue their discussions with other conference participants at a full afternoon session chaired by Dr. Scherer entitled, “Past, Present and Future of Risk Communication.”

### **Looking toward effective breast cancer risk communication with teachers**

The study team for “Teachers and Breast Cancer: Understanding the Knowledge and Perceptions of a Population at Risk,” looks forward to developing and disseminating the ongoing results of our project. As we monitor results from epidemiologic studies such as the CTS, we are optimistic about our communications study contributing toward the development of effective breast cancer communication efforts with teachers. We at BCERF hope to be able to provide future educational programs

on breast cancer risk, tailored to teachers. Although we still do not know why teachers have these elevated rates, we do now know that the enthusiasm and motivation of this group will go far toward reducing risk. We thank all participating teachers and the NEA for bringing us this far in the research process. 

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*This research is supported in part by the Cornell University Agricultural Experiment Station federal formula funds, Project No. NYC-131470, received from Cooperative State Research, Education and Extension Service, U.S. Department of Agriculture. Any opinions, findings, conclusions, or recommendations expressed in this publication are those of the author(s) and do not necessarily reflect the view of the U.S. Department of Agriculture. Additional funding provided by the New York State Departments of Health and Environmental Conservation.*

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# Induced Abortion is Not Associated with Breast Cancer Risk

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The recent Supreme Court appointments have made everyone aware once again of the high degree of contention that exists surrounding the issue of abortion. This contention has carried over into the area of breast cancer risk. Several groups are claiming that abortion is related to an increase in breast cancer risk. Currently, three states, Mississippi, Missouri and Texas, are mandating pre-abortion counseling discussing breast cancer risk (Gutmacher Institute, 2006). In February 2003, the National Cancer Institute held a workshop with scientific experts in this area of research and updated their position on this issue (National Cancer Institute, 2003). The summary statement from this workshop conveyed that it is “well established” that induced abortion is not associated with breast cancer risk. This was a strong statement as “well established” is the highest category for their strength of scientific evidence evaluation. Similar statements have also been made by the World Health Organization (World Health Organization, 2000), the American Cancer Society (American Cancer Society, 2005) and both the American and Royal (British) Colleges of Obstetricians and Gynecologists (ACOG, 2003; RCOG, 2004). This article will review this area of research by examining the issues that were likely to have been important in these evaluations. An earlier article in *The Ribbon* (available at <http://envirocancer.cornell.edu/Newsletter/articles/v8balancing.cfm0>) presented the decisive types of scientific evidence that are necessary to define a cause-effect relationship. This article will examine whether the scientific evidence for a relationship between induced abortion and breast cancer meets these standards. Although there are more than sixty studies that have examined this issue, most of the examples in this discussion will be drawn from a collaborative reanalysis in which the researchers in almost all of the existing studies concerning abortion and breast cancer shared all their data, which was pooled and reanalyzed as a single set (Beral et al., 2004). This method allowed for compensation for many of the shortcomings of the individual studies.

First, a little background on epidemiological studies is in order. There are two types of epidemiological studies that are relevant in this evaluation. The first type is known as a cohort study. In this type of study, information is gathered for a large group of women without breast

cancer. Following a period of time, the information from the cohort women who have gotten breast cancer and those who have not is compared and analyzed. Cohort studies are considered to be most reliable as healthy people are thought to have less bias and provide more accurate information. The second type of study is a case-control study. In this type of study, information about abortion and breast cancer risk factors is gathered and analyzed for women who have breast cancer and similar women who do not have breast cancer. The majority of studies that have examined abortion and breast cancer risk have been case-control studies.

## **Study characteristics which contributed to varying results**

As a bit more background, there are several problems that can occur when these studies are carried out.

**Reference Group Choice.** The first problem is connected with the group that is chosen as the reference group for risk comparisons. Epidemiological studies define risk factors by comparing the incidence of breast cancer in an “exposed group” (in this case women who have had abortions) to the incidence of breast cancer in a similar but “unexposed group” (women who have not had abortions). Giving birth causes changes in the breast that reduce breast cancer risk and a study’s results would be different depending on whether the reference “unexposed” group was made up of women who have given or not given birth. Some studies have compared the breast cancer risk of women who had abortions to women who had not given birth, others to women who had given birth, and some studies did not designate. These three study designs would be expected to produce different levels of breast cancer risk.

**Reporting Bias.** The second study design problem involves the accuracy of the determination of whether women in the study group have had abortions; this is known as reporting bias. Study participants typically do not know what aspect of breast cancer risk is under examination and women with breast cancer have been found to more freely report having had an abortion than women without breast cancer. The resulting skew of information can have a substantial effect on case-control studies examining the association of induced abortion and

breast cancer risk.

**Adjustment for “Confounding.”** Careful epidemiological studies account for the effect of members of the study groups having established breast cancer risk factors. For example, age is a substantial risk factor and almost all studies correct for differences in age between the “exposed” and “unexposed” groups under study. This is known as adjusting for confounding. Many of the abortion and breast cancer studies have adjusted for only a few breast cancer risk factors and their results are less trustworthy.

**Effect Modification.** There are other characteristics that might affect the change in the strength of association between abortion and breast cancer risk. Such things as the length of the aborted pregnancy, the women’s reproductive history, and the number of abortions could potentially have effects. These aspects are known as effect modifiers and their contribution to any resulting breast cancer risk may or may not have been accounted for.

### **Major standards for demonstrating cause-effect relationships**

Now, on to how well the scientific evidence supports the idea that abortion has a cause-effect relationship with breast cancer; i.e. how well the evidence fits the standards for a cause-effect relationship.

**No consistent association across studies.** The first of the cause-effect standards is that the available studies show a consistent association between induced abortion and breast cancer. It would be expected that if a relationship existed that most studies would find and report it consistently. Studies of abortion and breast cancer risk have not met this standard. The results of these studies have been inconsistent. There are reports of increased risk, decreased risk, and no association. Differences in reference group definition, reporting bias, adjustment for confounding and effect modification are likely to have contributed to this inconsistency.

**Strong association not seen.** The second cause-effect standard is that there would be a strong association between having had an abortion and getting breast cancer. This standard has also not been met. Collaborative pooling and reanalysis of the data from almost all the existing studies reported a relative risk value of 1.11 for studies in which abortion information was supplied by the study participants. This value is considered to indicate a “not evident” or “very weak” increase in breast cancer risk. Some studies have sought to eliminate reporting bias and have relied on medical records or healthy reporting (as in

cohort studies) of abortion and this method has produced better consistency. However, collaborative pooling and reanalysis of almost all these studies reported a relative risk of 0.93; this value is considered a “not evident” or “very weak” decrease in breast cancer risk. Of the 53 separate studies that met the criteria for the pooling reanalysis (100 or more women with breast cancer, in a country with liberal abortion laws, and having systematically sought after reproductive history), the largest reported relative risk was 1.40, which would be considered a moderate increase in breast cancer risk. A relative risk value of 1.0 represents a “not evident” association. The values from the collaborative reanalysis and other large studies, including one study of 1.5 million women in Denmark (Melbye et al., 1997), strongly suggest a lack of a relationship between abortion and breast cancer.

**No dose-effect relationship.** The third standard would be that a dose effect be demonstrated. This would mean that women who had more abortions would have a higher risk of breast cancer. This standard was also not met. In the pooling reanalysis, women who had two or more abortions did not have a higher risk of breast cancer than women who had one abortion. Examination of the results of individual studies that examined this issue also supports no change in risk for women who have had more abortions.

**Biological plausibility exists.** The fourth standard is that the effect be biologically plausible. Animal studies support the plausibility of there being a relationship between abortion and breast cancer risk (Russo et al., 1982). But this support is dependent on reference group choice. Animals whose pregnancies are terminated at about the middle of the pregnancy term (day 12 of a 21 to 23 day gestation period) have comparable numbers of tumors following carcinogen treatment and levels of proliferation to similar aged virgin rats. Levels of proliferation in the breast are related to the susceptibility of these breast cells to cancer causing chemicals. However, the levels of proliferation and tumors formed in the pregnancy-terminated rats were higher than similar aged animals that completed their pregnancies. It should also be noted that pregnancy, while ultimately decreasing breast cancer risk, is linked to a temporary increase in risk following childbirth. (Hsieh et al., 1994; Lambe et al., 1994; Liu et al., 2002) Accordingly, the time during the pregnancy when the abortion occurs may be important. Most abortions occur within eight weeks of the 40 week human gestation period, and this is a different pregnancy time period than that examined in the animals.

*continued on page 6*

# News from the Web

**1▶** This month we are featuring Fact Sheet #18, Vegetables and Fruits and the Risk of Breast Cancer. This fact sheet was revised in July 2005. The authors are Barbour Warren, PhD, Research Associate with BCERF and Carol Devine, PhD, Associate Professor, BCERF and the Division of Nutritional Sciences. The complete list of BCERF fact sheets is available online. Fact sheets (and other BCERF materials) are available for downloading and distribution for educational purposes.

**2▶** A new bibliography, "Women, the Workplace, and Breast Cancer Risk." was posted in February 2006. This covers topics including Occupations and Cancer Risk, Breast Cancer Risk Due to Occupational Chemical Exposure with references for specific chemicals, and Breast

**<http://envirocancer.cornell.edu>  
is BCERF's home on the web.**

Cancer Risk in Specific Occupations. The bibliography was developed by Suzanne Snedeker, PhD, BCERF Associate Director of Translational Research, and Katarzyna Fertala, Undergraduate Research Assistant.

**3▶** BCERF holds Regional Cancer and Environment forums twice a year in New York State. Our website includes details about the next scheduled forum and an archive of summaries from forums dating back to 1996.

Subscribers to the BCERF eUpdate receive periodic emails detailing additions to the site and current BCERF news. If you'd like to subscribe to the eUpdate, send an email to Ellen Hartman: [eh79@cornell.edu](mailto:eh79@cornell.edu).

## RESEARCH COMMENTARY

### Induced Abortion is Not Associated with Breast Cancer Risk *continued from page 5*

**Time of exposure appropriate.** The final standard is that the time of exposure be appropriate. This standard is met. 97% of abortions are carried out in women younger than 40 years old (CDC, 2006) and 99% of breast cancer cases occur after 40 (National Cancer Institute, SEER Cancer Statistics Review 1975-2002).

As this analysis demonstrates, only two of the five main standards for a cause-effect relationship are met. This indicates that while many studies have examined this relationship, there is little evidence to support abortion causing breast cancer. This underlies the National Cancer Institute's statement that it is "well established" that induced abortion is not associated with breast cancer risk.

The decision regarding an abortion is certainly one of the most difficult that couples or individual women ever have to make. Fear of an association of induced abortion and breast cancer should not enter into this extremely difficult decision.

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# Credible Health Information on the Web

Last year BCERF revamped our web site. During the course of the project we collected information on accepted standards for presenting health information on the web, and then incorporated those standards into our redesigned site. In addition we learned what measures of quality are commonly used to determine the trustworthiness of web sites, particularly health information web sites.

Some sites that offer listings of criteria useful in evaluating health information web sites are the Health on the Net Foundation (<http://www.hon.ch/home.html>), URAC (<http://www.urac.org>), and the Stanford University Web Credibility Project (<http://credibility.stanford.edu>).

Visitors to health information web sites can do their own evaluation of the site by checking for easily located information about the source and purpose of the information, funding, links to other groups or companies, and privacy.

The source and purpose of the posted information should always be clear. A trustworthy web site will make it easy to discover who wrote the information, when it was written and/or revised, what the author's credentials are, and whether the information is fact or opinion. Web sites can meet these criteria by including the name of the author with each piece, publication and revision dates, references, and links to author biographies including pertinent credentials.

Links to and from the web site to other groups and organizations should be identified as links and explained. If a web site is commercial, any links or influences from advertisers should be identified as commercial, not infor-

mational. If the web site provides links to other sites, the links should be accompanied by a statement explaining the endorsement policy. If following a link takes a visitor off the original web site and to another, that should be stated.

Credible web health resources provide facts about funding sources. Many health information web sites are funded by companies with an interest in providing products

*continued on back cover*

## Web Credibility Checks

**Authors and Credentials:** Is it easy to identify the author of the information and to evaluate their credentials? Do their credentials match the field about which they are writing?

**Timeliness:** Can you tell when the information was written and/or revised? If it is information that should be updated, do the updates happen on a regular schedule?

**Funding Connections:** Is it clear if the organization providing the information is commercial or not-for-profit? Are funding sources and partners clearly disclosed?

**Personal Information/Privacy:** If the web site collects personal information, are you asked beforehand? Is the privacy policy acceptably defined?

**References:** Are references provided to back up the factual claims on the web site? Are the references to other reputable, credible sources?

Guttmacher Institute (2006). State Policies in Brief: Mandatory Counseling and Waiting Periods for Abortion (New York, NY, Guttmacher Institute), pp. 1-3. Available at: [http://www.guttmacher.org/statecenter/spibs/spib\\_MWPA.pdf](http://www.guttmacher.org/statecenter/spibs/spib_MWPA.pdf)

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*The Ribbon* is published by the Cornell Program on Breast Cancer and Environmental Risk Factors in New York State. Funding provided by the New York State Departments of Health and Environmental Conservation.

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**Credible Health Information on the Web** *continued from page 7*

or services. This must be clear to visitors. Other health information sites are not-for-profit but are funded by diverse groups. These sources of funding support must also be disclosed.

Patient privacy should be at the forefront for web health sites that collect personal information. If the web site asks for any type of personal information, it must include a privacy policy and must disclose all uses of the collected information. A best practice is for the web site to allow visitors to “opt in” or agree to provide the information before it is collected. There should also be a provision for destroying personal information at the request of the visitor.

While evaluating health web sites using these general criteria will help to identify credible sources, always check with your physician about any treatment recommendations. 

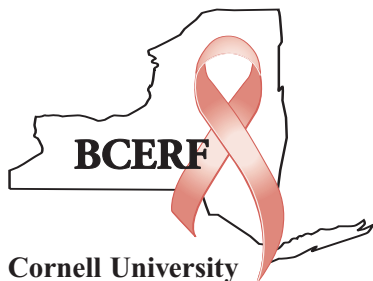
**BCERF Standards**

BCERF has always had a full-disclosure policy. We identify our authors, their credentials, references, and publication and revision dates for our web resources. We also include information about our grant funding. While we track hits to our pages in order to understand which resources are the most widely-used, we have never collected personally identifiable information about visitors.

In addition to these basic standards, we evaluate our materials for readability, usefulness, and accuracy. Some of the evaluation methods we’ve employed include surveys, focus groups, usability testing, and peer-reviews.

We also submitted our site to the Health on the Web Foundation and have been given an Honor Code seal according to their health web site standards.

In fact, you can participate in our evaluation efforts by taking the survey posted on our home page (<http://envirocancer.cornell.edu>). We always appreciate input. Contact us through the email or postal addresses listed on the back page of *The Ribbon*.



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