

RETHINK PLASTIC PILOT STUDY COMMUNITY REPORT

- Funded as a Community Research Collaboration by the California Breast Cancer Research Program
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The ReThink Plastic Study is a Collaboration of the Child Health and Development Studies research team and Participant Advisory Council, and Plastic Pollution Coalition.

Study Goals and Objectives

The chemicals used in the manufacture of many plastics are known to mimic estrogen activity. There is strong scientific evidence linking these “environmental estrogens” to breast cancer. The **ReThink Plastic** study was designed to reduce exposure to these chemicals using simple, practical behavior change and to build a coalition of plastic use reduction by spreading the study messages. This approach could result in broad benefits by effectively reducing exposure to harmful chemicals in plastic and thus protecting against breast cancer and protecting the environment against plastic pollution.

Specifically, the objectives of the study were to:

- 1) Inform participants about the harmful effects of chemicals that are in plastic
- 2) Teach participants simple ways to reduce the use of plastic in order to reduce the potential for harmful health effects
- 3) Ask participants to spread the message to other friends and family
- 4) Evaluate the effectiveness of the study:
 - a) Examine changes in “plastic use” behavior before and after the study
 - b) Examine changes in estrogenic activity before and after the study in a small sub-study of post-menopausal women

Study Design

The **ReThink Plastic** study was a pilot study, meaning that it engaged a small number of participants in order to test whether the study design was effective. Since the study required including a diverse cross-section of the community that spanned outreach to older women, we targeted churches, community colleges, and workplace settings to recruit people. We contacted leaders in these settings to establish an opportunity to recruit 72 participants, to present a 45-minute education program, and to arrange a follow-up discussion session one month later. These community leaders helped us establish dates for the two study sessions at their settings and announced the sessions (in church bulletins, in the classroom, and using workplace flyers) in advance in order to promote attendance.

There was also a sub-study within the study that involved recruiting 20 post-menopausal women for a blood test. The blood test could only be performed in “post-menopausal” (i.e. no longer menstruating) women because it is a new test of estrogenic activity that is still being developed. In order to make sure the test results were not influenced by a woman’s own fluctuations in estrogen production, we needed to use blood from women whose estrogen production was low and relatively stable, as is the case for women who have stopped having menstrual periods.

In brief, study participants were asked to:

- 1) Meet as a group to:
 - a) Complete a 20-minute survey, or “pre-test”
 - b) Participate in a 45-minute education program
 - c) Provide a small sample of blood if eligible
- 2) One month later, meet again as a group to:
 - a) Complete a second 20-minute survey, or “post-test”
 - b) Participate in a follow-up discussion evaluating the study messages
 - c) Provide a second small sample of blood if eligible

At the first study meeting, participants were asked to complete the 20-minute survey before the education session. The survey included questions about knowledge and behavior around plastic use. The education session included a 20-25 minute presentation, followed by an informal discussion which often lasted about 20-30 minutes. During the education session, participants were shown 5 short (less than 3 minutes) videos which explained the health and environmental impacts linked to harmful chemicals in plastic. We discussed methods to reduce exposure to these chemicals by reducing plastic use, provided alternatives for plastic products, and reviewed the study brochure which reinforced these concepts.

The primary objective of the meeting was to explain and reinforce the main study messages:

- 1) Use glass or stainless steel water bottles.
- 2) Never microwave food in plastic containers.
- 3) Store food in glass or ceramic containers.
- 4) Skip canned foods and beverages.
- 5) Reduce take-out food.
- 6) Don't handle receipts with bare hands. (If you do, wash with soap and water as soon as possible and DO NOT use hand sanitizer).
- 7) Spread these plastic use reduction messages to family and friends.

During the month between the two study sessions, participants were asked to practice these steps and to disseminate these messages to family and friends.

At the second study meeting, participants completed a 20-minute survey about knowledge and behavior as well as a section asking them to report whom they had talked to about the study. They also engaged in an evaluation discussion about how they had practiced the study messages, what steps they found difficult or easy, whether they had discovered other alternatives, and, more generally, how they felt about the study.

Study Settings

The study was successfully conducted at the following settings:

- Easter Hill United Methodist Church, Richmond, CA
- El Sobrante United Methodist Church, El Sobrante, CA
- Berkeley City College, Berkeley, CA
- Laney College, Oakland, CA
- The Public Health Institute, Oakland, CA

Members of the Easter Hill United Methodist Church and El Sobrante United Methodist Church, and all students in the Laney College "EcoArt Matters" and Berkeley City College "Artist as Citizen" classes were invited for participation as were all employees at the Public Health Institute.

How many people participated in the *ReThink Plastic* study?

More than 93 people participated in this project, surpassing our target of 72. African Americans were well-represented, comprising 26% of study participants.

Table 1. ReThink Plastic Participation

	Completed Pre-test only	Completed both Pre and Post-tests	Total
African American	11	14	25
Non-African American	13	53	66
Unknown Race*	1	1	2
Total	25	68	93

*Two participants of unknown race not shown in this table completed only a post-test.

Table 1 shows participation for the pre-test and post-test by race. Paired response to both the pre-test (survey during the first session) and post-test (survey during the second session) was obtained from 68 participants. These participants provide the basis for the results given in this report.

Which study settings were most successful?

Most people participated via their church (Figure 1). The largest number of participants engaged through churches (53%) and college classes (23%). The “Other” setting in Figure 1 represents the home of one of the study educators and included family and friends of the study educator. Regardless of study setting, participation was very high—70% or greater completed both surveys in all three settings: churches, colleges, and workplace (Figure 2).

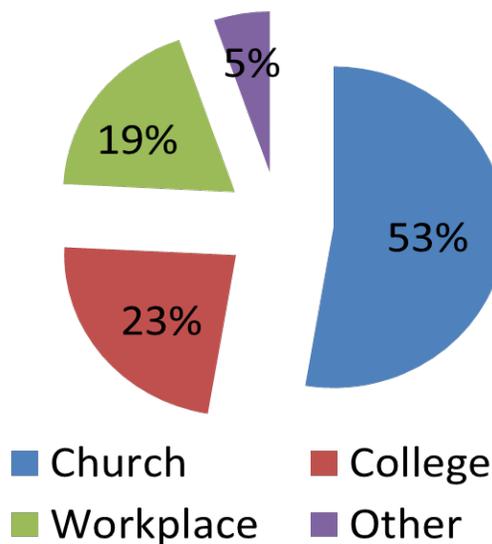


Figure 1. ReThink Plastic Study Setting

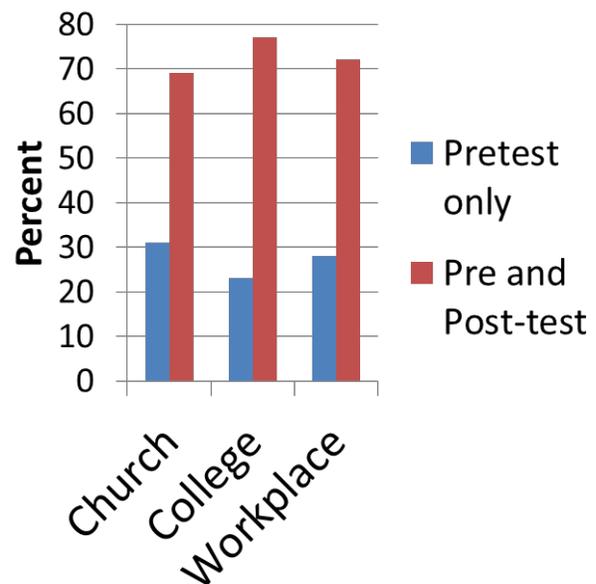


Figure 2. ReThink Plastic Study Participation by Setting

Was the study effective at reducing exposure to chemicals in plastic?

Yes! Change in nearly every behavior queried on the pre- and post-test surveys was statistically significant and in the desired direction.

Behavior is rated on a scale from 1 (least frequent or concerned) to 4 (most frequent or concerned) Mean=Average N=Number of participants	N	Mean		Direction of Behavior Change
		Before Education Session	After Education Session	
In the last month, how often did you purchase:				
Frozen vegetables or fruit?	68	3.14	3.04	-----
Prepared frozen meals for heating in the microwave?	68	1.22	1.01	↓
Canned ingredients?	67	1.96	1.43	↓
Canned ready-to-eat soups or foods?	67	1.31	0.93	↓
Hot take-out food in to-go containers?	66	1.74	1.57	↓
Bottled water in individual serving plastic bottles?	68	1.66	1.06	↓
Bottled water in plastic gallon bottles?	68	0.81	0.33	↓
In the last month, how often did you eat/drink:				
Home-cooked meals with fresh/frozen vegetables?	68	3.71	3.44	-----
Prepared meals that can be heated in the microwave?	67	1.34	1.01	↓
Home-cooked meals with canned ingredients?	67	2.26	2.07	-----
Canned ready-to-eat soups or foods?	68	1.19	0.81	↓
Hot take-out food?	67	2.04	1.80	↓
Hot take-out drinks like coffee/tea in disposable cups?	68	1.69	1.47	↓
Hot take-out drinks like coffee/tea in glass/stainless steel?	66	1.22	1.25	-----
Hot take-out drinks like coffee/tea in your own plastic container?	67	0.54	0.40	-----
Bottled water from individual sized plastic bottles	67	1.82	1.09	↓
About cash register receipts in the last month, how often did you:				
Request an email receipt?	65	1.12	1.31	-----
Take the receipt in your hand?	65	3.65	2.78	↓
Ask the clerk to put the receipt in your bag?	66	1.80	2.12	-----
Put the receipts in your wallet?	64	2.54	1.58	↓
Use gloves to handle your receipts at home?	67	0.08	0.07	-----
Store your receipts in a plastic bag?	66	0.34	0.22	↓
Clean your hands with hand sanitizer after handling receipts?	66	0.27	0.96	↑
Wash your hands with soap and water immediately?	64	0.37	1.88	↑
Wash your hands later (e.g. before eating) after handling receipts?	61	2.82	2.86	-----
How concerned are you about:				
Plastic pollution in the oceans or environment?	66	3.46	3.51	-----
Health effects of chemicals in plastic?	66	3.32	3.40	-----
How confident do you feel about:				
Reducing your exposure to chemicals to plastic?	64	2.52	2.75	-----

Table 2 presents responses to questions about shopping behavior and consumption related to plastic products. *The questions focused on behavior related to the main sources of exposure to chemicals in plastics which occur through consumption of food and beverages.* Participants reduced their purchasing and consumption of food designed to be heated in the microwave, canned foods, hot take-out food, hot coffee in disposable cups, and bottled water. They also took a receipt in their bare hands less often and more often washed with soap and water immediately following handling a receipt. Participants were asked to respond to these questions using a 4-point scale where 1 represented least frequent behavior and 4 corresponded to most frequent behavior. Questions about environmental concern and confidence about reducing exposure were also rated on a 4-point scale where 1 corresponded to least concerned and 4 to most concerned. Table 2 reports the mean (i.e. average) levels of these behaviors at the pre-test and at the post-test, administered one month later. Behaviors denoted in a blue font with a blue arrow were statistically significant and desired behavior changes. Only one behavior change was significant in the direction opposite to the study message—this is denoted in a red font with an upward red arrow. Although the warning against using hand sanitizer after handling receipts was incorporated into the education session, it was not included in the study brochure. This suggests that message reinforcement—especially for more nuanced messages—is critical. Overall, the behavior change demonstrated by findings reported in Table 2 overwhelmingly indicate that the study messages were clear, strong, feasible, and effective at changing behavior, at least in the short term.

Further, we observed that study messages were equally effective and resonant for African Americans and non-African Americans alike, suggesting that this intervention was successful and relevant to both communities. Pilot study findings strongly support the concept that reducing exposure to harmful chemicals in plastic is an attainable goal. *Table 2 supports the conclusion that ReThink Plastic was largely effective in changing plastic use behavior.*

Were the study messages spread to others?

Yes! Participants were asked whether they talked to family, friends, and social contacts about six different aspects of the study, and they did. Table 3 gives the results associated with the responses to these questions.

Table 3. Number of Contacts (family/friends) who were told about study messages by participants

	African Americans			non-African Americans				
	Mean*	Range (min, max)		Total Contacts	Mean*	Range (min, max)		Total Contacts
Talked to others about using more fresh/frozen vegetables	8	0	18	111	6	0	30	332
Talked to others about microwaving in glass, not plastic	7	0	16	104	7	0	30	339
Talked to others about not handling cash register receipts	7	0	16	92	7	0	30	370
Told others take-out food is a source of chemicals in plastic	6	0	17	88	5	0	30	283
Talked to others about the ReThink Plastic project	8	1	21	113	8	0	36	426
Gave others a ReThink Plastic brochure	7	0	21	90	5	0	22	235
Total for both race groups**								539

*Mean number of contacts per participant was not different by race.

**Total includes both race groups and does not sum to Total Contacts due to overlap in categories.

Table 3 shows that for each study participant, as many as 6-8 contacts were given information about how to reduce exposure to plastic.

From 68 direct participants (Tier One), 539 secondary contacts (Tier Two) learned about some aspect of the ReThink Plastic study, demonstrating the salience of this issue and the effectiveness of using this type of social network approach to disseminate information (Figure 3).

It is notable that there were no significant differences in the magnitude of message transmission for African Americans compared to non-African Americans, once again reinforcing the conclusion that this intervention was equally relevant to both communities. **Results shown in Table 3 and Figure 3 support the conclusion that message spread following the ReThink Plastic education session was highly successful.**



Figure 3. Study participants spread the ReThink Plastic messages

What we learned from participants during the follow-up session discussion groups

Discussion groups during the education session and at the follow-up discussion session were very informative. Highlights of insights provided by our participants include:

- Participants were uncomfortable playing the role of “educator.” They felt they lacked the expertise required to talk about the health effects of exposure to chemicals in plastic and appreciated being able to refer to the video URLs and the study brochure we provided them.
- There were many comments about the brochure, and some were contradictory or difficult to simultaneously address. A number of participants felt that the brochure needed to be more compelling and should include more details about the “why” of ReThink Plastic rather than focusing on the “how.” Others thought the brochure size made it inconvenient to carry around for distribution and suggested that a “business card” format would be more practical and therefore more successful for message dissemination.
- A few participants asked if we could come present to another group they were part of, including an ESL (English as a Second Language) classroom, a woman’s philanthropic organization (PEO), and the NAACP.
- Participants told us that the people they talked to about ReThink Plastic did not want to disclose their contact information (primarily email address) to the study team.
- Participants felt rewarded and respected by incentives. Everyone who participated in the education session received a stainless steel water bottle, branded with the study name. They generally liked receiving these but some offered other suggestions such as glass storage containers.
- After learning about the harmful effects of plastic, both to human health and to the environment, some participants expressed a feeling of being overwhelmed by trying to eliminate plastic from their lives. Study staff tried to reassure participants that even doing a little bit—such as eliminating use of plastic water bottles—would have a very large impact. In addition, building advocacy that promotes policy change to reduce use of plastic and provide environment-friendly alternatives is a powerful and effective mechanism.

What were the results of the blood tests?

The blood draw sub-study was conducted to: 1) analyze a new blood test, called AroER tri-screen that measures estrogenic activity in the blood; 2) determine whether women would agree to a blood donation for this purpose; and 3) determine whether they would want their results. The AroER tri-screen was developed by Dr. Shiuan Chen, Professor and Chair of the Department of Cancer Biology, Beckman Research Institute of City of Hope. This blood test was performed in Dr. Chen's laboratory. Rather than test for one estrogen-mimicking compound at a time, the AroER tri-screen test is designed to determine total estrogenic activity in tested samples. Thus, it provides the opportunity to perform more general exposure assessment, without requiring the identification and testing of each single potentially harmful chemical, one at a time. This assay also measures the impact of chemicals in combination providing the possibility of evaluating the overall effect of a mixture of exposures, more closely resembling what occurs in real life. However, the AroER tri-screen test is a very new blood test and we don't know if it is sensitive enough to measure differences in individual women or differences before and after women made changes to reduce their exposure to plastics. The results from this sub-study provide early, preliminary clues about whether it can be used to measure a woman's exposure to environmental chemicals that imitate estrogens. For this sub-study, we recruited only post-menopausal women who had stopped menstruating because it was important to collect blood from women whose natural estrogen levels were low and relatively stable.

Blood was drawn from 19 post-menopausal women who participated in both sessions and completed both pre-test and post-test surveys. ***For 68% of the women who gave blood (13 of the 19), estrogenic activity decreased one month after practicing the study messages.*** We were unable to link this decrease in estrogen activity to any particular behavior change—all of the 19 had desired behavior change. Age and race were also not related. However, we did see different patterns of estrogen activity change according to participants' body mass index (BMI). By examining estrogen activity change in BMI groups (normal and overweight), we learned that the six participants who experienced no reduction in estrogen activity were all among the overweight group. Further, the overweight group encompassed participants with both increased and decreased estrogen activity, while the normal BMI group included only participants with decreased estrogen activity. It is important to note that we are not sure whether the estrogen activity decrease was related to some behavior that we did not measure in the study. Also, importantly, this result was observed in a small sample without a control group for comparison and therefore results needs to be tested further verified.

Significantly, this small pilot blood study established the acceptability of blood donation in African and non-African American post-menopausal women and demonstrated the capability of measuring change in estrogenic activity in the blood of study participants using the new AroER tri-screen test.

What did we learn from the study?

1. The ***ReThink Plastic*** study was successful at reducing exposures to harmful chemicals in plastic.
2. The ***ReThink Plastic*** study was successful at getting people to talk to members of their families, friends, and communities about the study messages.
3. People were willing to provide blood samples and the AroER tri-screen blood test shows very promising preliminary results that need further testing.

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