

# Behavior Change Consortium



## [ Outcomes Report ]

2008

*“The Art of Collaboration. The Science of Change.”*

*The Behavior Change Consortium wishes to acknowledge the following individuals, whose efforts helped to both initiate and sustain its momentum:*

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*Behavior*  
**CHANGE**  
consortium

## Background / Overview

In October 1997, the National Institutes of Health (NIH) Office of Behavioral & Social Sciences Research (OBSSR) announced a special Request for Applications (RFA) entitled "Innovative Approaches to Disease Prevention Through Behavior Change." The goal of this initiative was to stimulate investigation of novel strategies designed to achieve long-term healthy behavior change by focusing on tobacco use, sedentary lifestyle, poor diet, and alcohol abuse. The RFA solicited intervention studies aimed at either a comparison of multiple theoretical approaches to a single behavior change or an assessment of the utility of single behavior change theory in a multibehavioral or multiple-theory framework.

Coordinated by the OBSSR, this four-year grant program represented an unprecedented partnership among 17 Offices and Institutes of the NIH, including the:

- Office of Disease Prevention;
- Office of Research on Women's Health;
- Office of Dietary Supplements;
- National Cancer Institute;
- National Center for Complementary and Alternative Medicine;
- National Heart, Lung, and Blood Institute;
- National Institute on Aging;
- National Institute on Alcohol Abuse and Alcoholism;
- National Institute of Allergy and Infectious Diseases;
- National Institute of Arthritis and Musculoskeletal and Skin Diseases;
- National Institute of Child Health and Human Development;
- National Institute of Dental and Craniofacial Research;
- National Institute of Diabetes and Digestive and Kidney Diseases;
- National Institute of Mental Health;
- National Institute of Neurological Disorders and Stroke; and the
- National Institute of Nursing Research.

This initiative represented the integration of concepts and recommendations from several reports calling for increased research on key health behaviors and lifestyle factors affecting disease. These reports are all available online, and include:

- "Physical Activity and Health: A Report of the Surgeon General" (1996);
- the Human Capital Initiative Strategy Report, "Doing the Right Thing: A Research Plan for Healthy Living," (1996);
- the NIH Office of Disease Prevention and Health Promotion Conference, "Disease Prevention Research at NIH: An Agenda for All" (1993);
- the "Report of the National Institutes of Health: Opportunities for Research on Women's Health" (1991);
- the Office of Alternative Medicine-sponsored workshop, "Alternative Medicine, Expanding Medical Horizons" (1992);
- NCI's "Working Group Report on Priorities in Behavioral Research in Cancer Prevention and Control" (1996);
- the NIA report of the "National Invitational Conference on Research Issues Related to Self-Care and Aging" (1996); and
- a 1996 AHA Expert Panel Report on "Awareness and Behavior Change."

The recommendations of these reports were consolidated into a lengthy list of research topics, which was presented to representatives of organizations within and outside NIH as the proposed basis for an RFA. In recognition of the fact that interventions were to take place in real-world settings, the RFA required multidisciplinary partnerships between behavior change experts, intervention specialists, and health professionals. This initiative also prompted a unique collaborative opportunity, inviting projects so large in scope that they could only be funded through a trans-NIH partnership. It was this partnership that permitted NIH to encourage studies costing up to \$700,000 in annual total cost per individual grant.

Selected on the basis of the scientific peer review, the sponsoring organizations awarded approximately \$8 million annually from 1999-2002 to fund the 15 research grants featured in this supplemental issue. The grantees attended semi-annual meetings co-sponsored by the American Heart Association (AHA), in order to report progress, discuss problems, and share information related to the conduct of their grants. A Behavior Change Consortium (BCC), composed of NIH program staff, research investigators from the 15 sites, and representatives from AHA and Robert Wood Johnson Foundation, was established to explore the opportunities for collaboration across the 15 sites.

Two reports commissioned from the National Academy of Sciences (NAS) identified a broad domain of questions at the interface of social, behavioral, and biomedical sciences, whose resolution could lead to major improvements in the health of the U.S. population, and both stressed the importance of approaching these questions from an interdisciplinary perspective. In describing their visions of

future directions, these reports emphasized research priorities that cut across institute boundaries at the NIH; thereby underscoring the broad significance of behavioral and social science research for multiple disease outcomes as well as for health promotion. These are the ingredients for a program of behavioral and social science research that will advance our ability to change behavior in ways that will prevent disease over the long term.

The BCC has served as a model of collaborative research and funding across NIH Institutes as well as across different settings, populations, and intervention strategies. The BCC was the first cohort of grants in the behavioral and social sciences to voluntarily come together after funding to form multi-site partnerships, or workgroups. By removing the geographic barriers between research institutions, the BCC was able to share resources, data, energy, and vision. In so doing they have produced insights that have served to both strengthen the products of the individual sites, and lead to important cross-site findings as well. The work of the BCC has been interdisciplinary in nature, it has led to new measurement and methodological techniques, and it has furthered our efforts to translate basic behavioral and social science research into clinical and community practice. In short, through collaboration, the BCC has fulfilled the highest hopes of the NAS committees for behavioral change intervention research.

The successes of the BCC led to the establishment of the Health Maintenance Consortium, a second-generation NIH multi-site collaborative which addresses the follow-up science question of how behavior change gains can be maintained <<http://hmrc.sph.tamhsc.edu/default.aspx>>. The BCC approach—bringing together academics, government, and private philanthropy—can serve as a model for other national research efforts.

Triple helix research—research collaborations between government, academia, and industry—is vital to the promotion of global health and the elimination of health disparities. The BCC helped change the nature of scientific inquiry by demonstrating that collaborative, transdisciplinary research requires substantially different mechanisms for interaction, rapid translation of research findings to practice, and mentorship of junior investigators.

NAS References:

National Research Council (2001). [New Horizons in Health: An Integrative Approach](#). Committee on Future Directions for Behavioral and Social Sciences Research. B.H. Singer and C.D. Ryff, eds. Commission on Behavioral and Social Sciences and Education. Washington, DC: The National Academies Press.

Institute of Medicine (2003). [The Future of the Public's Health in the 21st Century](#). Washington, DC: The National Academies Press.

*Research,*  
**projects'**  
**SUMMARY**  
**and Outcomes**

## *Brown Medical School/ The Miriam Hospital*

### *Project Name ...*

*Motivating Parents of Kids With Asthma to Quit Smoking:  
The PAQS Project*

### *Funding Sponsor ...*

*National Heart, Lung, and Blood Institute  
[ Grant No. 1 R01 HL62165-01 ]*

### *Principal Investigator ...*

*Belinda Borrelli, Ph.D.  
Center for Behavioral and Preventive Medicine  
Brown Medical School*

### *Project Summary ...*

The PAQS project contrasted two theory-based smoking cessation interventions for parents of children with asthma, and compared mechanisms of behavior change within and across theoretical perspectives. It was hypothesized that enhancing the perception of risk to self and child would motivate smoking cessation more than standard approaches that emphasized building self-efficacy and coping skills for quitting in a population not motivated to quit smoking.

The study utilized a two-group, randomized design to compare the efficacy of two theoretically based interventions for smoking cessation using: 1) the Behavioral Action Model (BAM), based on the Agency for Health Care Policy and Research clinical guidelines, and aimed at goal-setting and skill building to enhance self-efficacy to quit smoking; and 2) the Precaution Adoption Model (PAM), which tailors to the smoker's readiness to quit, and incorporates biomarker feedback in order to increase risk perception of smoke exposure to self and child. Data analysis examined: 1) quit rates, environmental tobacco smoke (ETS) level and motivation to quit as the primary dependent variables; 2) mediators of behavior change between and within conditions; and 3) associations between parent smoking outcomes and child asthma morbidity (i.e., ER visits and asthma symptoms) post-treatment.

### *Research Design ...*

Smokers ( $N=288$ ) and their asthmatic children who received nurse-delivered in-home asthma education were randomized into one of two treatment conditions: 1) BAM, in which nurses emphasized goal-setting and skill-building to enhance self-efficacy to quit smoking; or 2) PAM, in which nurses tailored the intervention to the smoker's readiness to

quit and incorporated biomarker feedback (i.e., level of carbon monoxide exposure to the smoker; level of ETS exposure to the child) in order to increase risk perception in smokers. In both conditions, smokers who were ready to quit received the nicotine patch.

### *Research Hypotheses ...*

- PAM will outperform BAM on “change in motivational readiness to quit,” biochemically verified 7-day point prevalence abstinence, reduction of ETS, and number of quit attempts.
- The mediators of behavior change proffered by the PAM theory (e.g., risk perception) will change differentially in those receiving a PAM intervention vs. those receiving the BAM intervention. BAM mediators (e.g., self-efficacy) will be specifically sensitive to the BAM intervention.
- Improved ETS and smoking outcomes for caregivers will result in a variety of improvements in asthma outcomes.

### *Findings ...*

- **Sample Description (Caregivers):** The average caregiver's age was 32.2 years ( $SD=8.3$ ), 89.5% were female, and 40% were married, engaged or co-habiting. The ethnic composition of the sample was: 53% White, 22% Black, 19% Hispanic, 2.0% American Indian, and 2% Cape Verdean. Thirty percent were employed full-time, and the majority reported incomes of less than \$20,000 per year (67%). The average number of cigarettes smoked per day was 14.4 ( $SD=9.3$ ).
- **Sample Description (Children):** The average age of the child with asthma was 5.9 ( $SD=4.8$ ) with a range of < 1 year to 17 years of age. On average, children had mild asthma, 9 days of asthma symptoms in the previous month ( $SD=10.8$ ), and missed an average of 5 days of school due to asthma in the previous year ( $SD=8.9$ ). Fifty-eight percent of parents reported that their child had received oral steroids for asthma, 9% endorsed a history of a respiratory arrest due to asthma, and 5% indicated a history of intubation for asthma. Furthermore, at baseline, 61% of the sample reported that their child had been seen in the ER within the previous year for asthma, and 33% reported that their child had been hospitalized for asthma in the previous year.

☐ **Smoking Outcomes for Caregivers:**

	<u>Education</u>	<u>Counseling</u>
7-Day Point Prevalence	14.3%	28.6%
Continuous Abstinence	9.5%	14.3%
Attempted to Quit	66.7%	81.0%
Used Nicotine Patch	57.1%	70.0%
Requested Nicotine Patch	35.0%	49.0%

\* None of the above differences were significant.

☐ **Asthma Outcomes for Children:** Data were collected at baseline and end of treatment on the frequency of children's asthma symptoms in the past month, including episodes of wheezing, nighttime coughing, early morning symptoms, severe symptoms, and activity and sports limitation due to asthma. No group differences were found at baseline or follow-up.

☐ No baseline group differences were found in healthcare utilization, school absences, ER visits, or hospitalizations. At end of treatment, the PAM group reported fewer ER visits and fewer doctor visits for asthma in the previous month. No other group differences at the end of treatment were found.

*Implications and Future Directions ...*

This translational research project attempted to bridge the gap between theory-based research and public health contexts. The research also sought to identify which treatment produces health behavior change, as well as the processes by which behavior change occurs. The novel approach of incorporating smoking cessation into a medical visit for asthma education increases the potential to improve not only one, but two health behavior outcomes—smoking cessation in the caregiver and asthma in the child. Identifying which smoking cessation treatments are most effective for parents of children with asthma, is the first step towards reducing two costly public health problems, and improving the quality of life for families of children with asthma.

The formation of partnerships between academic and non-academic organizations can enhance the probability that academically based research will reach the populations who need it most (i.e., minority, economically disadvantaged and possibly unmotivated to quit) and be maintained even after research funding has ended.

*Publications ...*

Borrelli, B., McQuaid, E. L., Becker, B., Hammond, K., Papandonatos, G., Fritz, G., & Abrams, D. (2002). Motivating parents of kids with asthma to quit smoking: the PAQS project. *Health Education Research, 17*(5), 659-69.

McQuaid, E. L., Walders, N., & Borrelli, B. (2003). Environmental tobacco smoke exposure in pediatric asthma: overview and recommendations for practice. *Clinical Pediatrics, 42*(9), 775-87.

## Weill Medical College of Cornell University

### Project Name ...

*Improving Health Behaviors and Outcomes After  
Angioplasty: Using Economic Theory to Inform Intervention*

### Funding Sponsor ...

*National Heart, Lung, and Blood Institute  
[ Grant No. 1 R01 HL62161091 ]*

### Principal Investigator ...

*Mary E. Charlson, M.D.  
Weill Medical College of Cornell University*

### Project Summary ...

Patients who have been relieved of cardiac symptoms following angioplasty may not be sufficiently motivated to initiate behavior changes that can reduce risk of subsequent cardiac events. Finding an effective means to help patients modify their behavior presents a unique challenge. This study examined the efficacy of an innovative behavioral intervention with net-present value economic theory as its theoretical underpinning. This intervention was evaluated with a randomized controlled trial in which all patients complete a computerized baseline health assessment of 14 cardiovascular risk factors. Each patient was presented with an individualized risk-factor profile and asked to choose risk factors for modification. In the experimental group, each risk factor was presented with a corresponding numerical biologic age value that represented the relative potential to benefit from modifying each risk factor. Risk reduction for these patients was framed as the opportunity to reduce present biologic age (the net-present value), and improve current health status and quality of life. In the control group, risk reduction was framed as the value of preventing future health problems, a standard risk-factor approach. The study aimed to demonstrate that economic theory may be a plausible perspective from which to design interventions aimed at communicating risk and facilitating change in health behaviors.

### Research Design ...

Six-hundred participants completed a computerized baseline health assessment of 14 cardiovascular risk factors, including physical activity, smoking, diet, blood pressure, and medications. Behavior changes of interest included increasing physical activity, smoking cessation, cholesterol reduction, weight loss, and controlling diabetes. Based on an individualized risk-factor profile, each participant chose two or three risk factors for modification. Patient education about

each risk factor was framed using either a standardized approach or an experimental biologic-age approach, where each factor was weighted according to its relative risk. Both groups were followed and interviewed every three months for two years. The telephone contacts provided motivational interviewing support to participants in both groups.

### Research Question ...

The study was designed to evaluate whether a novel behavioral intervention based on individualized feedback of risk profiles, framed as the opportunity to reduce one's biologic age (net-present value), was more effective in reducing mortality and major cardiovascular morbidity than the standard risk-reduction approach (future value).

### Findings...

- **Sample Description:** The mean age of patients was 62 years ( $SD=11$ ); 27% were female; 22% were African American or Latino; 63% were married; 42% were college graduates; 43% were working full time, and 37% were retired. Patients presented with moderate coronary artery disease; 58% had unstable angina prior to angioplasty; 37% had a prior myocardial infarction. The mean ejection fraction is borderline normal and the majority (65%) received angioplasty or stenting in only one vessel. At baseline, only 17-22% of the sample had undergone prior bypass surgery or angioplasty/stenting; 57% had hypertension; and 26%, diabetes; 65% had only one vessel angioplasty/stent, while 26% had two vessels, and 8% three or more vessels. One-third of patients were depressed at baseline, and 15% reported no social support.
- On average, patients had 3-6 risk factors that were recommended for change, from which they chose 2-3 for change. The most common risk factors chosen for change were overall physical activity, smoking cessation, and weight loss. Patients had high self-efficacy immediately after angioplasty. For any given behavior change, patients were in either the precontemplation, contemplation, preparation, action or maintenance stage of change. Immediately after angioplasty, most patients reported they were in the preparation stage on their chosen risk factors, which is noteworthy because, in most studies, the majority of patients are either in precontemplation or in action/maintenance.
- With respect to multi-behavior change at one year, 59% of patients reached the action stage of change on at least one health behavior, and 26% on two or more behaviors. In total, 33% of patients reached the maintenance stage on one behavior, and 17% reached maintenance on two or more behaviors.

### Implications and Future Directions ...

Angioplasty patients appeared to have a problem in initiation and maintenance of multiple-behavior change. In order to identify the characteristics, sequence, and attributes of patients who successfully initiated and sustained behavior change in two or more behaviors at 12 months, patients were given the opportunity to select new factors, and the stage of change was assessed at each follow-up.

Based on the results of this trial, characteristics, sequence, and attributes of patients who have successfully initiated and sustained behavior change in two or more behaviors at 12 months allows for future research to evaluate interventions that influence stages of change and behavior-specific self-efficacy. New randomized trials can build on the results of the current trial evaluating the two approaches to framing health risk information (present/net value vs. standard/future value) in motivating behavioral changes and improving two-year outcomes.

### Publications ...

Charlson, M. E., Algrante, J. P., McKinley, P. S., Peterson, J. C., Boutin-Foster, C., Ogedegbe, G., & Young, C. R. (2002). Improving health behaviors and outcomes after angioplasty: Using economic theory to inform intervention. *Health Education Research, 17*(5), 606-18.

Boutin-Foster, C., & Charlson, M. E. (2007). Do recent life events and social support explain gender differences in depressive symptoms in patients who had percutaneous transluminal coronary angioplasty? *Journal of Women's Health, 16*(1), 114-23.

Boutin-Foster, C., Ogedegbe, G., Peterson, J., Briggs, W. M., Algrante, J. P., & Charlson, M. E. (2008). Psychosocial mediators of the relationship between race/ethnicity and depressive symptoms in Latino and white patients with coronary artery disease. *Journal of the National Medical Association, 100*(7), 849-55.

Algrante, J. P., Peterson, J. C., Boutin-Foster, C., Ogedegbe, G., & Charlson, M. E. (2008). Multiple health-risk behavior in a chronic disease population: what behaviors do people choose to change? *Preventive Medicine, 46*(3), 247-51.

## Emory University

### Project Name ...

*Healthy Body, Healthy Spirit: A Church-Based Nutrition and Physical Activity Intervention*

### Funding Sponsor ...

National Heart, Lung, and Blood Institute  
[ Grant No. 1 R01 DE13093-01 ]

### Principal Investigator ...

Ken Resnicow, Ph.D.  
Health Behavior & Health Education  
University of Michigan School of Public Health

### Project Summary ...

African-Americans are significantly less likely to be physically active than other Americans and, like all Americans, they consume fewer than the recommended five fruit and vegetable (FV) servings per day. This study had two primary aims: 1) to test the effectiveness of a culturally tailored self-help dietary (FV intake) and physical activity (PA) intervention compared to standard health education materials; and 2) to test the effectiveness of using Motivational Interviewing (MI), delivered by telephone, to modify PA and dietary habits. The study was a randomized effectiveness trial with three experimental conditions. Participants were African-American adults recruited through local black churches. Despite the extensive use of MI to modify addictive behaviors, this study represented one of the first controlled field trials to employ MI to address diet and PA. Secondly, this was one of the first studies to test the effectiveness of a self-help diet and PA intervention tailored for an African-American church population.

### Research Design ...

This study utilized a three-group, cluster-randomized design with churches, rather than individuals, assigned to treatment conditions. Prior to randomization, churches were matched in triplicates, and stratified by income and size. The study tested the effectiveness of a culturally-sensitive self-help diet and PA intervention among African-Americans, as well as the effectiveness of adding four telephone counseling calls to the self-help intervention.

- Group 1 (Comparison=C) received standard PA and nutrition education materials ( $n=267$ );
- Group 2 received an intervention package (Tx1) that included culturally-sensitive nutrition and physical activity videos, an audio tape, cookbook, and written materials ( $n=335$ );

- Group 3 (Tx2) received the same intervention as Group 2, plus 4 telephone counseling calls based on Motivational Interviewing (MI) ( $n=304$ ).

### Research Hypotheses ...

The study tested three primary hypotheses:

- Individuals receiving a culturally-sensitive multicomponent intervention (Tx1) will show significantly greater improvement in diet (e.g., FV intake) and PA patterns than those receiving standard exercise and nutrition education materials (Comparison).
- Individuals receiving a culturally-sensitive intervention plus four telephone counseling calls using motivational interviewing techniques (Tx2) will show greater improvement in FV intake and PA than those receiving a culturally sensitive self-help intervention without telephone counseling (Tx1).
- Comparing groups Tx1 and Tx2 will determine the efficacy of telephone-based MI in changing diet and PA behaviors.

### Findings...

- **Sample Description:** One-thousand fifty-six individuals were recruited across 16 socio-economically diverse Black churches in the Atlanta metropolitan area. The mean age of participants was 46.3 years ( $SD=13.3$ ; range 18-86). The sample was predominantly female (76%). More than 60% reported income greater than \$40,000 annually, and more than 70% reported some post-secondary education. The three intervention groups did not differ significantly on any baseline variables.
- **Results on Fruit and Vegetable Intake:** The change in FV intake was largest in Group 3 (increased 1.13 servings/day) and intermediate in Group 2 (increased 0.44 servings/day). A Group x Time effect was significant for Group 3 compared to both Groups 1 and 2.
- **Results on Physical Activity:** Total minutes of PA increased significantly more in Group 3 compared to Group 1 for each of three PA index scores. Group 2 increased activity significantly more than the control group for two of the three PA index scores. Groups 3 and 2 did not differ on any of the three indices.
- **Association Between Intervention Exposure and Outcomes:** Individuals who reported using the cookbook and watching most or all of the FV video from Groups 2 and 3 showed a significantly greater increase in FV intake than those not using these materials. Similarly,

individuals who reported using the activity guide showed a significantly greater increase in physical activity than those not using the guide. Although those who reported watching most or all of the activity video showed a greater increase in activity than those not watching the activity video, these differences were not statistically significant. Regular use of the pedometer was associated with a greater increase in activity, and this difference was statistically significant for moderate/vigorous activities and the index of exercise items.

- **Simultaneous Change of Diet and Activity:** Overall, 39% of the sample was classified as having made little or no change for both FV and PA, with the largest percent occurring in the comparison group (C). Approximately 44% of the participants reported making a moderate or large change in one health behavior but no change in the other. Specifically, this included 21% who reported a large FV change but no change in PA; 9% who reported a moderate FV change but no PA change; 10% who reported a large PA change and no FV change and 5% who reported moderate PA change but no FV change. The remaining 17% of participants reported making multiple changes. Across all three experimental groups, the most common pattern of multiple change was a large change for both FV and PA. The other three possible change patterns, large change in FV and moderate change in PA, large change in PA and moderate change in FV and moderate change in both FV and PA were infrequent, in the range of 1%-3%.

### Implications and Future Directions ...

There appear to be distinct segments of changers: Those who will make large changes in multiple behaviors, those who will change one behavior but not another, and so on. Future research should attempt to identify such segments *a priori*. Future research will also include more studies using MI with varying intensity and duration, and additional work on culturally tailored interventions.

### Publications ...

Resnicow, K., Jackson, A., Braithwaite, R., Dilorio, C., Blissett, D., Rahotep, S., & Periasamy, S. (2002). Healthy Body/Healthy Spirit: a church-based nutrition and physical activity intervention. *Health Education Research*, 17(5), 562-73.

Resnicow, K., McCarty, F., Blissett, D., Wang, T., Heitzler, C., & Lee, R. E. (2003). Validity of a modified CHAMPS physical activity questionnaire among African-Americans. *Medicine and Science in Sports & Exercise*, 35(9), 1537-45.

Resnicow, K., Campbell, M. K., Carr, C., McCarty, F., Wang, T., Periasamy, S., Rahotep, S., Doyle, C., Williams, A., & Stables G. (2004). Body and soul. A dietary intervention conducted through African-American churches. *American Journal of Preventive Medicine*, 27(2), 97-105.

Resnicow, K., Jackson, A., Blissett, D., Wang, T., McCarty, F., Rahotep, S., Periasamy, S. (2005). Results of the healthy body healthy spirit trial. *Health Psychology*, 24(4), 339-48.

Campbell, M. K., Resnicow, K., Carr, C., Wang, T., & Williams, A. (2007). Process evaluation of an effective church-based diet intervention: Body & Soul. *Health Education and Behavior*, 34(6), 864-80.

## Harvard School of Public Health

### Project Name ...

*Reducing Disease Risk in Low-income, Postpartum Women*

### Funding Sponsor ...

*National Institute of Child Health and Human Development  
[ Grant No. 1 R01 HD37368-01 ]*

### Principal Investigator ...

*Karen Peterson, Sc.D., R.D.  
Department of Maternal and Child Health  
Harvard School of Public Health*

### Project Summary ...

Low-income, multi-ethnic women are at elevated risk for obesity and chronic diseases, yet influences at different levels may act as barriers to changing risk behaviors. Following the birth of a child, childrearing and social isolation can exacerbate these influences. The social ecological framework integrates behavior-change strategies at different levels, providing a strong theoretical base for developing interventions in this high-risk population. The primary purpose of this randomized controlled trial was to test the efficacy of an educational model delivered by community-based paraprofessionals for improving diet, activity and weight loss among new mothers over a 12-month postpartum period and a 6-month maintenance period. This model focused on fostering institutional change to support behavior changes at intrapersonal and interpersonal levels, through collaboration with federal programs for low-income families: the Special Supplemental Food Program for Women, Infants and Children (WIC), and the Expanded Food and Nutrition Education Program (EFNEP). Participants were randomized to the Usual Care, ( WIC nutrition and breastfeeding education), or Enhanced EFNEP intervention arm, consisting of Usual Care plus a sustained, multicomponent intervention including home visits, group classes and monthly telephone counseling.

### Research Design...

A total of 700 WIC-eligible postpartum women from two urban areas were enrolled in the study. The usual WIC care condition consisted of nutrition-risk appropriate counseling and breastfeeding consultation at the first postpartum and follow-up visits up to 12 months from delivery. The Enhanced EFNEP intervention condition consisted of usual WIC care plus a multi-component intervention over a 12-month period.

Intervention participants received five home visits, four group classes from EFNEP paraprofessionals, and monthly motivational telephone calls from program staff. Printed materials included recipes and personal logs that supplemented the educational components. Intervention participants also received bi-monthly calls during a maintenance period from 12-18 months after delivery.

### Research Hypotheses...

It was hypothesized that improvements in primary outcomes (fruit and vegetable intake, saturated fat consumption, total moderate-to-vigorous activity) would be significantly greater at 12 months postpartum among women participating in the intervention.

Other specific aims were to:

- determine the effect of the intervention on secondary outcomes (BMI, and indicators of fat mass and distribution) compared with those assigned to usual care.
- explore the role of mediating and modifying variables outlined in the conceptual framework.

### Findings ...

- **Sample Description:** Among 660 women comprising the baseline sample, mean age at recruitment was 27 years. Three-quarters were Latina/Hispanic, 8% African-American, 15% White. Almost two-thirds (64%) reported Spanish as their native language, as well as the language typically spoken at home (60%). The majority (54%) of Latinas were immigrants with an average time in U.S. of eight years. More than two-thirds (69%) of participants at baseline had 12 or fewer years of education; 34% did not graduate high school.
- At baseline, 88% reported consuming fewer than five servings of fruits and vegetables per day. Of these, 68% planned to increase fruit and vegetable consumption to this level within the next six months. Intervention messages to reduce saturated fat intake emphasize three or fewer servings red meat per week; 52% of the sample were very sure they could limit red meat, 30% were somewhat sure. At baseline, the women were very inactive, but many were open to behavior change. Only 20% reported regular physical activity at baseline. Mean level of moderate activity estimated from the 7-Day PAR was 1.4 hrs./week, and mean vigorous activity level was .06 hrs/wk. Of those who reported no regular physical activity, 78% planned to engage in regular physical activity within the next 6 months.

### Implications and Future Directions...

The feasibility of multi-behavior change in low-income, immigrant new mothers depended not only on receiving an intervention operationalizing behavioral theories at the intra- and interpersonal levels, but also on evidence of organizational change in programs serving the target population.

Future research must utilize qualitative measures in a mixed-methods approach to investigate social and economic predictors in order to inform development of nutrition education curricula for low literacy audiences; examine the role of food security and program participation on primary study outcomes; and examine maternal beliefs, practices and behaviors in the cohort that may be related to child feeding and their relationship to infant diet and growth.

### Publications ...

Peterson, K. E., Sorensen, G., Pearson, M., Hebert, J. R., Gottlieb, B. R., McCormick, M. C. (2002). Design of an intervention addressing multiple levels of influence on dietary and activity patterns of low-income, postpartum women. *Health Education Research*, 17(5), 531-40.

Surkan, P. J., Peterson, K. E., Hughes, M. D., & Gottlieb, B. R. (2006). The role of social networks and support in postpartum women's depression: a multiethnic urban sample. *Maternal and Child Health Journal*, 10(4), 375-83.

Ebbeling, C. B., Pearson, M. N., Sorensen, G., Levine, R. A., Hebert, J. R., Salkeld, J. A., & Peterson, K. E. (2007). Conceptualization and development of a theory-based healthful eating and physical activity intervention for postpartum women who are low income. *Health Promotion Practice*, 8(1), 50-9.

# Illinois Institute of Technology

## Project Name ...

*Partners for Life: A Theoretical Approach to Developing an Intervention for Cardiac Risk Reduction*

## Funding Sponsor ...

National Heart, Lung, and Blood Institute  
[ Grant No. 1 R01 HL62158-01 ]

## Principal Investigator ...

Tamara Sher, Ph.D.  
Institute of Psychology  
Illinois Institute of Technology

## Project Summary ...

Long-term maintenance of behavioral change to reduce health risk factors is essential to producing a positive effect on medical outcomes. This study examined whether an ongoing, long-term relationship could be used to help patients diagnosed with coronary artery disease adhere to a risk-reducing behavioral intervention and maintain healthy behavior change. One hundred and sixty patients with diagnosed coronary artery disease were randomized to a standard behavioral treatment group or to standard treatment, including a couples intervention, and followed for 18 months. The treatment in both groups followed tenets of cognitive-behavioral and Self-Determination theories as well as the Transtheoretical Model of Behavior Change. In addition, the couples intervention was designed to: 1) change the patient's environment to facilitate cardiac risk-reducing behavioral changes; 2) optimize social reinforcement and motivation for behavior change; and 3) decrease relationship stress. Behavioral outcomes assessed included adherence to an exercise regimen, adherence to dietary recommendations, and adherence to lipid-lowering medication. Lipid values, psychological variables and relationship variables were also assessed throughout the study and at follow-up. It was expected that both groups of cardiac patients would successfully adopt new health behaviors; however, the couples intervention was anticipated to be superior in helping maintain long-term health behaviors.

## Research Design ...

Participants were recruited from a major metropolitan area through cardiologists at participating hospitals, newspaper advertisements, and other media outlets. A total of 160 participants were recruited and randomized into either the couples or individuals group. Eligibility criteria required a

cardiac event history, being married or living with a partner, no current alcohol or drug abuse, and permission from the participant's cardiologist to participate. Participants were also eligible for weight loss, exercise, and lipid-lowering medication interventions.

## Research Hypotheses ...

Based on the theoretical background from both the behavioral change and couples literature, and recommendations from the two literatures about the importance of including a partner into behavioral change program, three primary hypotheses were generated.

Compared with participants in the individuals group, those in the couples group will be more likely to:

- improve adherence to an exercise program and sustain long-term involvement in exercise.
- improve adherence to a weight loss or weight maintenance program (if needed), make positive dietary changes (such as lowering fat intake), and sustain long-term weight loss and dietary changes.
- improve long-term adherence to lipid lowering medication.

Further, it was hypothesized that participants in the couples group would gain additional health benefits when compared with those in the individuals group, such as improved mood, health functioning and quality of life, and improved medical outcomes, such as the occurrence of acute events, hospitalizations, and changes in symptom patterns and medication.

## Findings...

- Preliminary results suggested that people were making changes as a result of the intervention, and these changes were being maintained or even continued at follow-up. Additionally, the intervention was serving to reduce depressive symptoms and increase relationship satisfaction, for those beginning at distressed levels.
- The nutritional changes that patients reported did not translate into weight loss or BMI change. It's possible that change was smallest in the diet area because patients believed that changing their exercise and activity patterns, and adhering to their medications supplanted the need for any substantial diet changes.
- Decreased depression and increased relationship satisfaction suggested that patients and partners were happy with the changes they had made, and it was better for their relationships.

### *Implications and Future Directions ...*

*Partners for Life* was the first project to incorporate three important theoretical models — Cognitive-Behavioral Couples Therapy, Self-Determination Theory, and the Transtheoretical Model of Behavior Change — into one program in order to effect change across time. Preliminary findings suggested that using a multi-theoretically based intervention, including a partner, could have direct benefits on both patients and partners involved in long-term behavioral change programs especially in terms of distress and relationship satisfaction.

Design of a long-term, low-cost and low-burden intervention that is acceptable to both health care systems and their patients should be the focus of new work in this area, and should examine the additive implications of risk factors. It is also important to understand how individuals made decisions regarding what behaviors they chose to change and maintain, versus what behaviors they did not attempt to change.

### *Publications ...*

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# Kansas State University

## Project Name ...

*Healthy Youth Places: Youth Environments Promoting Nutrition and Physical Activity*

## Funding Sponsor ...

*National Institute of Child Health and Human Development  
[ Grant No. 1 R01 HD37367-01 ]*

## Principal Investigator ...

*David Dziewaltowski, Ph.D.  
Community Health Institute  
Kansas State University*

## Project Summary ...

To reduce the risk for chronic disease, adolescents should eat at least five servings of fruit and vegetables and be physically active daily. The *Healthy Youth Places* project examined whether an intervention strategy that implemented school environmental change—with adult leader and youth participation—would influence and maintain adolescent fruit and vegetable consumption and physical activity. Using an experimental design, 16 middle schools were randomized into intervention and control schools, and the health behavior of a cohort of adolescents were assessed during Grades 6 (baseline), 7 and 8 (intervention), and 9 (follow-up). The HYP project used an ecologically informed social cognitive model to establish a place-based intervention that encouraged participation in the planning process and implemented environmental change in targeted adolescent physical and social environments (school lunch place and after school program place). Environmental change was defined as implemented practices, programs and policies that promoted connection, autonomy, skill-building and healthy norms in places. These critical elements were hypothesized environmental antecedents to social cognitive mediators of behavior change. HYP developed a place-based dissemination model of multiple levels (project, school and place) that were hypothesized to build the skills and efficacy of leaders (school staff and youth) who implemented environmental changes.

## Research Design ...

*Healthy Youth Places* was a group-randomized trial in which 16 middle schools were rstratified on setting level variables (school size, concentration of poverty, ethnic diversity) into three groups (large/moderate to high resource; small/moderate to high resource; large, low resource, diverse) and randomized within strata to an intervention ( $n=8$ ) or comparison ( $n=8$ ) condition. The middle schools recruited for participation housed Grades 6-8 and agreed to

participate prior to randomization. The behavior and potential determinants of physical activity and diet of a cohort were assessed each spring (i.e., Grade 6, baseline; Grade 7, intervention; Grade 8, intervention) to minimize seasonality effects. Follow-up data were collected to determine if the adolescents generalize their new skills, efficacy, and behavior to their high school environments by collecting data during spring of the cohort's Grade 9.

## Research Hypotheses ...

The HYP project tested whether an intervention strategy that implemented school environmental change with adult leader and youth participation influenced and maintained adolescent fruit and vegetable consumption and physical activity. The project developed a place-based dissemination model of multiple levels (project, school, and place) that were hypothesized to build the skills and efficacy of leaders (school staff and youth) to implement environmental changes in the school lunch place and after school place. A second aim of the project was to determine the individual and setting level processes affecting sustained physical activity and fruit and vegetable consumption.

## Findings ...

- At baseline, 74% of 6th graders (compared to 20th day enrollment reports) had active parental consent and participated in the data collection. The project was successful in tracking 76% of the intervention and 68% of the comparison cohort across the first three years of the study. At baseline, a mixed model ANOVA revealed no differences between intervention and comparison schools on any primary outcome measures. The intervention schools significantly increased in vigorous physical activity (VPA) over the three-year study. There was a significant mixed model VPA intervention effect. There was also a significant difference in VPA performed each day post-intervention between experimental and comparison schools. No intervention effects were found for fruit and vegetable (FV) consumption, which decreased across the study for 6th, 7th, and 8th grades.
- The intervention significantly increased the targeted mediator of self-efficacy for school physical activity environmental change over the three years of the study. Control schools significantly decreased and intervention schools significantly increased in self-efficacy for school physical activity environmental change.

## Implications and Future Directions ...

These findings provided evidence that an intervention framework that involved youth and adult leaders in a participatory process to build healthy environments could have a significant impact on both the psychosocial development and physical activity of middle school youth

over a three-year period.

Further analyses may be able to identify the personal and setting level processes that mediate the effectiveness of the intervention and may determine sustained behavior change. It's possible that increasing self-efficacy for finding and creating supportive environments may be a particularly effective strategy for promoting the maintenance of regular PA because it requires less self-regulatory effort over time to perform a behavior in an environment that supports the behavior than it does to cope with barriers in an unsupportive environments.

Although the intervention was successful in building the environmental change efficacy of youth and their physical activity, the intervention did not influence fruit and vegetable consumption. Because the intervention site coordinators and youth leaders were facing a constant battle of competing demands by attempting to promote two behaviors in two places (school lunch and after-school programs), future studies implementing the *Healthy Youth Places* process may have greater effects if there is a focus on developing the social and physical of one healthy place at a time (either after-school programs or school lunch).

### Publications ...

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# Oregon Health and Science University

## Project Name ...

*Promoting Healthy Lifestyles: Alternative Models' Effects (PHLAME)*

## Funding Sponsor ...

*National Institute of Arthritis and Musculoskeletal and Skin Diseases  
[ Grant No. 1 R01 AR45901-01 ]*

## Principal Investigator ...

*Diane Elliot, M.D.  
Division of Health Promotion & Sports Medicine  
Oregon Health and Science University*

## Project Summary ...

Compelling evidence indicates the benefits of regular physical activity, diets low in fat and high in fruits and vegetables, and maintenance of a healthy body weight; however, most Americans do not adhere to these recommendations. As a group, fire-fighters have a concentration of the same harmful behaviors and health risks commonly afflicting the US population. Despite their work demands, firefighters have a high prevalence of sedentary lifestyles, obesity, hypertension, dyslipidemia and certain malignancies, and their work structure is a natural setting for a team-centered program.

The PHLAME study evaluated the efficacy of two intervention strategies for improving nutrition and physical activity practices in firefighters: 1) a team-centered program, and 2) a one-on-one format targeting the individual. PHLAME compared these two behavior change models (the team-based versus the one-on-one approaches) against a usual-care control group.

Firefighters employed a unique work structure which was ideal for a team-centered model of behavior change. This strategy, based on Social Learning Theory, focused on a team of firefighters who worked together on the same shift. The one-on-one intervention incorporated the Transtheoretical Model of Behavior Change, used Motivational Interviewing for its counseling strategy. Findings provide information about the process and outcomes of these models' ability to achieve health behavior change.

## Research Design ...

PHLAME's lifestyle objectives reflected four lifestyle behaviors, and the study compared a testing-plus-results only control group and two worksite health promotion

strategies: 1) a team-centered peer-taught scripted curriculum; and 2) one-on-one meetings with a trained counselor using motivational interviewing (MI) techniques. PHLAME's team-centered curriculum used principles of adult learning and was grounded in social learning theory, with one's actions being influenced by external observations, vicarious experiences and peers. MI was used as a client-centered communication strategy, and facilitated participants in defining their internal motivation for change by resolving ambivalence and choosing ways by which to actualize personal goals. The physiological measures and individual survey items and constructs were assessed using autoregressive generalized estimating equations (GEE) and repeated measures GEE, which took into account the subjects-nested-at-stations design.

## Research Hypotheses ...

Primary outcome measures for the prospective head-to-head comparison reflect PHLAME's four health promotion goals, potential mediating variables, stage of change and secondary consequences of those actions, e.g., lipid levels and blood pressure.

The four health promotion goals were to: 1) increase physical activity to at least 30 minutes per day; 2) reduce intake of saturated and trans-fats; 3) increase consumption of fruits and vegetables to at least five per day; and 4) reduce body fat to healthy levels. Newer statistical methods, such as hierarchical linear and latent growth modeling, were used to validate hypothesized model structure, and identify relationships and sequences among variables/ mediators. The process assessments allowed distinguishing effects of the interventions and their implementation.

## Findings...

■ **Sample Characteristics:** The sample included 579 males (97%) and 20 females, with a mean age of 41 years (range of 20 to 60 years old). A majority were white (91%), married (79%) and reported annual household incomes of \$50,000 or greater (79%). Although the MI condition was slightly older ( $p < 0.01$ ) and had more runs per shift ( $p < 0.001$ ), at baseline no clinically meaningful demographic differences were present. Attrition was not different among conditions. The sample included 579 males (97%) and 20 females, with a mean age of 41 years (range of 20 to 60 years old). A majority were white (91%), married (79%) and reported annual household incomes of \$50,000 or greater (79%). Although the MI condition was slightly older ( $p < 0.01$ ) and had more runs per shift ( $p < 0.001$ ), at baseline no clinically meaningful demographic differences were present. Attrition was not different among conditions, nor did it have interaction effects on outcomes, and analyses were performed on those present at one-year follow up.

- Despite relatively high baseline levels, both intervention groups significantly increased fruit and vegetable consumption ( $p < 0.01$  team and  $p < 0.05$  MI). Paralleling those changes, the healthy dietary behavior construct also significantly increased in both intervention groups ( $p < 0.005$  for both); however, only the team firefighters significantly increased dietary understanding ( $p < 0.005$ ) and the positive dietary support construct ( $p < 0.001$ ). Changes in physical activity were modest, and neither intervention impacted significantly on measured peak oxygen uptake. Exercise understanding was high at baseline and did not change.
- Significant effects also were seen for Body Mass Index, with less weight gain among the two intervention groups ( $p < 0.05$  for both). In addition, the index of general well-being significantly improved in both intervention groups ( $p < 0.01$  for each), compared to the control condition.

### Implications and Future Directions ...

Two different behavior-change strategies, a team-centered curriculum and individual MI, positively impacted nutrition behaviors, were associated with less weight gain, and enhanced general well-being compared to a testing and results-only control condition. The process leading to these changes may have differed for the two intervention formats. The team program altered dietary understanding, a finding consistent with knowledge mediating change in other nutrition interventions.

The team format also increased positive dietary social support, with that construct or latent variable comprised of factors that reflect both norms and group cohesion. Diet-specific team activities appeared necessary to capitalize on that influence, as a pre-existing team-oriented work structure and simultaneous MI participation alone did not increase that construct.

Firefighters have a unique work structure, and our subjects were almost all men. Clearly, further study of the team-centered paradigm, with additional measures at the team and individual level, are needed before extrapolating these findings to other settings. These findings provide a logical starting point for further inquiry into the team-centered format as a feasible and cost-effective means for health promotion.

NIH funding was received in 2004 to continue this research. PHLAME II (Promoting Healthy Living: Assessing More Effects) further advances understanding of behavior change and its two interventions: 1) team-centered, peer led, scripted TEAM curriculum; and 2) one-on-one motivational interviewing [MI] for health promotion. The research centers on three primary components: 1) longitudinal assessment of original PHLAME participants' health behaviors using advanced statistical techniques to compare the original three groups, define mediators of durability/lapses for immediate and longer-term outcomes and identify for whom and under

what conditions interventions appear most effective; 2) coding previously recorded motivational interviews and relating content to outcomes; and 3) partnering with national organizations of fire fighters to disseminate and assess the PHLAME TEAM program.

### Publications ...

Moe, E. L., Elliot, D. L., Goldberg, L., Kuehl, K. S., Stevens, V. J., Breger, R. K., DeFrancesco, C. L., Ernst, D., Duncan, T., Dulacki, K., & Dolen, S. (2002). Promoting Healthy Lifestyles: Alternative Models' Effects (PHLAME). *Health Education Research*, 17(5), 586-96.

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# Oregon Research Institute

## Project Name ...

*Enhancing Support for Women at Risk For Heart Disease: Mediterranean Lifestyle Trial*

## Funding Sponsor ...

*National Heart, Lung, and Blood Institute  
[ Grant No. 1 R01 HL62156-01 ]*

## Principal Investigator ...

*Deborah J. Toobert, Ph.D.  
Diabetes and Heart Disease Lifestyle Trials  
Oregon Research Institute*

## Project Summary ...

Coronary heart disease (CHD) is the leading cause of death and functional limitations among women in the U.S. Postmenopausal women with diabetes are at especially high risk of CHD, but CHD research with this population is very limited. Epidemiological and clinical studies suggest that diabetes is associated with increased risk for CHD that is greater in women than in men. CHD is a major cause of death and functional limitations in women, but the vast majority of CHD studies have primarily involved middle-aged men. There is convincing research evidence that healthy lifestyle behaviors, including low-fat diet, physical activity, stress management, smoking cessation, and social support, can reduce CHD risk.

## Research Design ...

A randomized trial was conducted to compare short-term (six-month) and longer-term (12- and 24-month) outcomes in women receiving usual care compared to a modified Ornish-type comprehensive lifestyle management (CLM) intervention. A total of 116 participants were randomized to usual care and 163 to the Mediterranean Lifestyle Program (MLP). The enhanced usual care condition participated in all assessments, received all laboratory reports, and received ongoing diabetes care from their physicians.

The MLP was conducted in four successive waves of approximately 40 women each. The initial intervention lasted six months and addressed primary behavioral risk factors affecting CHD in postmenopausal women (i.e., diet, physical activity, stress management, and social support). The intervention began with a 2-day nonresidential retreat, followed by six months of weekly meetings. The retreats jump-started the behavior change process and promoted camaraderie among the women. The retreats also provided the opportunity to learn the diet, stress-management, social support, and physical activity aspects of the program.

Retreats were followed by six months of weekly four-hour meetings consisting of one hour each of physical activity, stress management, Mediterranean potluck, and support groups. Outcomes included multiple CHD lifestyle behaviors (e.g., dietary intake, exercise levels, stress management, smoking cessation), physiological risk factors associated with CHD (e.g., serum lipids, hypertension, weight, vascular reactivity), HbA1c, and quality of life (e.g., depression, functioning).

After six months of intervention, MLP participants were further randomized to one of two types of maintenance: 1) a faded schedule of weekly meetings led by lay leaders, or 2) four meetings over 18 months with a project staff member to complete a personalized, computer-assisted program designed to enhance use of social resources supporting healthful lifestyle changes. Research Design ...

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After six months of intervention, MLP participants were further randomized to one of two types of maintenance: 1) a faded schedule of weekly meetings led by lay leaders, or 2) four meetings over 18 months with a project staff member to complete a personalized, computer-assisted program designed to enhance use of social resources supporting healthful lifestyle changes.

## Research Hypotheses ...

This study tests a theory-based comprehensive lifestyle management intervention to reduce CHD risk in postmenopausal women with type 2 diabetes. The main hypothesis was that those randomized to the *Mediterranean*

Lifestyle Program compared to a randomized usual care condition would make significantly larger improvements in targeted lifestyle behaviors, including eating patterns, physical activity, stress management, perceived social support, and body weight.

### Findings...

- **Diet:** The omnibus assessment for dietary measures was significantly in favor of the MLP condition. Six-, 12-, and 24-month follow-up analyses revealed a significantly greater improvement in adherence to the Mediterranean diet in the MLP compared to the usual care condition on all dietary measures. MLP participants adhered to all aspects of the diet more days per week than the usual care condition. Results also indicated significantly greater reductions in total fat and saturated fat consumption, and significant increases in daily fruit and vegetables servings in favor of the MLP participants. MLP participants demonstrated significant improvement in behavioral patterns related to low-fat eating, and there was a significant decrease in weight in MLP women compared to usual care.
- **Physical Activity:** Physical activity results paralleled those reported for dietary self-care. There was a highly significant overall effect for physical activity outcomes. All follow-up tests indicated that this was due to substantial increases in the MLP compared to usual care on the frequency, duration, and intensity of activity reported in the 7-day self-monitoring log; number of exercise sessions and number of minutes spent engaged in physical activity each day; and caloric expenditure per week for all activities.
- **Stress Management:** Stress-management results from the 7-day self-monitoring log indicated the MLP condition significantly increased the number of minutes per day and days per week engaged in stress-management activities compared to usual care. Follow-up tests at all assessment points revealed that MLP participants practiced these techniques a greater number of minutes on more days per week than usual care participants.
- **Social Resources:** There was a significant increase in the behavior-specific perceived supportive resources favoring the MLP condition. Further, the MLP participants significantly increased their perception of support for diet and exercise, at all assessment points, more than participants in the usual care condition. MLP participants also cited significantly greater perceived social resources from friends, family, and support group, but not from health care providers.

### Implications and Future Directions ...

It remains important to investigate the poorly understood natural history of longer-term (36- through 72-month) maintenance of change in multiple behaviors (i.e., dietary, physical activity, and stress management) related to CHD risk, as well as the effects of theoretically important mediating variables on relapse and maintenance. This research could rely on a framework that synthesizes social-cognitive, social-ecologic, and goal systems theories. It should also provide important scientific and theoretical information about the patterns of maintenance/relapse among multiple risk factors, and about the relative importance of theoretical mediating variables (e.g., self-efficacy, problem-solving, peer and community support). This natural history of maintenance may be examined using a variety of statistical approaches, including mediational and latent growth modeling techniques.

NIH funding was received in 2004 to continue this research. In the assessment-only "natural history" study, the longer-term (3- to 7-year) effects of the MLP will be examined using a variety of statistical approaches, including state-of-the-art mediational and latent growth modeling techniques. In addition, the potential for translating this program into the real world will be assessed using the RE-AIM evaluation framework, a cost-effectiveness analysis will be conducted, and dissemination of the intervention will begin if it proves cost-effective.

This second study represents the next logical step in this line of research, as it examines long-term maintenance of behavior change and lays the groundwork for translation of this successful intervention into practice. It will also provide important scientific and theoretical information about the patterns of maintenance/relapse among multiple risk factors, and about the relative importance of theoretical mediating variables (self-efficacy; problem-solving; peer and community support).

### Publications ...

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## Stanford University School of Medicine

### Project Name ...

*The Community Health Advice by Telephone (CHAT) Project*

### Funding Sponsor ...

National Institute on Aging  
[ Grant No. 1 R01 AG16587-01 ]

### Principal Investigator ...

Abby C. King, Ph.D.  
Stanford University School of Medicine

### Project Summary ...

Although mid-life and older adults represent the most sedentary segments of the American population, relatively little is known concerning the best methods for promoting physical activity in ways that expand the reach of programs to broader segments of the population. Expanding the reach of successful behavioral interventions to increase regular physical activity (PA) represents an important public health challenge, and provides an opportunity to evaluate the predictive ability of different theories of motivation, e.g., Social Influence Theory and Self-determination Theory. Social Influence approaches represent a means of enhancing extrinsic motivation (i.e., forces originating outside of the person) for behavior change, while Self-determination Theory focuses on the intrinsic motivational forces of perceived competence and autonomy that can promote and potentially sustain behavior change over time.

The objective of this study was to conduct a randomized controlled trial to evaluate the effects of a telephone-administered physical activity counseling program delivered by a person (social influence enhancement, reflecting stronger extrinsic motivational forces) or an automated computer program (cognitive evaluation enhancement, reflecting stronger intrinsic motivational forces) on one-year participation in and longer-term maintenance (through 18 months) of physical activity.

### Research Design ...

This study compared telephone counseling delivered by humans (social influence enhancement) vs. automated technology (self-determination enhancement). We randomized 218 sedentary, healthy men and women aged 55 years and older (M=60.6 years, SD=5.5, range 55-90 years) to a telephone-based PA counseling program delivered by health educators, the same program delivered by a computerized, automated telephone counseling system, or

an attention-control (health education) program. The major outcome was weekly minutes spent in moderate or more vigorous PA, measured by the Stanford 7-Day Physical Activity Recall (PAR) and validated via accelerometry. Other PA measures developed specifically for older adults (i.e., the CHAMPS PA questionnaire and the Yale PA questionnaire) were included to add to the literature concerning how sensitive to change such instruments are in the context of PA interventions. A range of self-report and health measures were also collected to evaluate potential moderators and mediators of intervention effects across the 18-month trial.

### Research Hypotheses ...

- Participants assigned to either of the two PA interventions would demonstrate significantly greater PA levels at six and 12 months relative to the control arm.
- During the more intensive first year of program delivery, participants in the human advice arm would show significantly higher physical activity participation levels relative to those assigned to the automated advice arm by virtue of the greater social influence that could be brought to bear by the human counselor.
- The automated advice arm would show less deterioration in physical activity participation levels during the time period between 12 and 18 months when counselor-initiated telephone contact ceased.

### Findings...

- Participants in the two PA arms reported a significantly greater number of minutes per week spent in moderate-intensity or more vigorous (MOD+) physical activity than those in the control arm at six months.
- At 12 months, participants in both intervention arms maintained their PA levels above the recommended 150 minutes/week, while participants in the Control arm remained underactive, with no differences between the two intervention arms.
- At 18 months, the two intervention arms remained significantly above their baseline physical activity levels, with the human advice arm reporting a mean of 169 minutes per week in MOD+ activity, and the automated advice arm reporting a mean of 147 minutes per week in MOD+ activity. While the 18-month physical activity means did not differ significantly from the 12-month means for the two intervention arms, each arm reported doing an average of about 15 minutes less of MOD+ activity at 18 months relative to 12 months.

- A greater proportion of intervention group participants met the Surgeon General's recommendations of at least 150 minutes per week of MOD+ activity at both 6 and 12 month.
- While the 7-Day PAR and the CHAMPS were both shown to be sensitive to change at six months, the Yale was not found to be sensitive to change.
- At 12 months, the human advice arm reported a significantly more positive quality of life and greater satisfaction with physical activity levels relative to the Control arm; the difference in scores between the automated advice and Control arms did not reach statistical significance for either measure.
- At 12 months, significantly positive changes in mediators were found between the two intervention arms relative to the Control arm: barriers self-efficacy level; three behavioral processes of change (i.e., substituting alternatives, committing yourself, and enlisting social support); and intrinsic motivation for exercise. Social support for exercise was found to be significantly higher in the human advice arm at 12 months relative to both the automated advice and Control arms.

### Implications and Future Directions ...

This is the first study to demonstrate that automated telephone interventions tailored to the needs of the individual can promote increases in physical activity levels among initially underactive adults that span 18 months. The telephone delivery format used for both health behavior programs has been shown to be a convenient, flexible, and potentially low-cost alternative to the more traditional group-based health promotion programs offered in the community. These results broaden the alternatives for the type of telephone counseling for physical activity that can occur, suggesting that automated telephone programs based on established behavioral theory can be nearly as effective in producing physical activity increases as telephone programs delivered by a trained health educator. Further research is needed to better define subgroups of mid-life and older adults who might respond particularly well to each of these two types of intervention programs.

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# University of Maryland

## Project Name ...

*Evaluating the Components of the Exercise Plus Program*

## Funding Sponsor ...

*National Institute on Aging  
[ Grant No. 1 R01 AG17082-01 ]*

## Principal Investigator ...

*Barbara Resnick, Ph.D.  
University of Maryland*

## Project Summary ...

Hip fracture is a major public health problem with striking consequences for the older adult, his or her family, and the health care system. By the year 2040, more than 650,000 hip fractures will occur annually in older adults over the age of 65. Recovery following a hip fracture has been shown to be greatly facilitated by participation in a rehabilitation program, and continued participation in a regular exercise program can improve functional recovery, muscle strength, and prevent future fractures. Despite the benefits of exercise, it is difficult to get older adults to initiate exercise activity, and helping them adhere to an exercise regime is even more challenging. It is essential to find ways to increase exercise activity in older adults.

Self-efficacy, a belief in the individual's capabilities to perform a course of action to attain a desired outcome, and outcome expectancy, the belief that carrying out behavior will lead to a desired outcome, are hypothesized to be critical factors in adhering to a regular exercise program. The primary aims of this study are to implement a home delivered self-efficacy based intervention to strengthen efficacy expectations (self-efficacy and outcome expectations) related to exercise, decrease perceived barriers to exercise, and improve exercise behavior and overall activity of older adults who have sustained a hip fracture. The secondary aims focus on the anticipated benefits that are expected to occur when older adults exercise regularly.

## Research Design ...

The study was a 12-month investigation using a 2x2 factorial design to test the impact of either the training component of the Exercise Plus Program, the Plus only component of the program, or the full Exercise Plus Program on the initiation of and adherence to a home-based exercise program for older women post hip fracture. Five acute care facilities were used to recruit participants. Baseline testing took place in the acute care setting, and the intervention component was implemented at home once traditional rehabilitation services were completed.

## Research Hypotheses ...

- Participants exposed to only the Exercise Training component of the intervention (Tx1) will have increased exercise behavior, more activity, and stronger self-efficacy expectations related to exercise compared to those in the usual care group (UC).
- Participants exposed to only the Plus component of the intervention (Tx2) will have increased exercise behavior, more activity, and stronger self-efficacy and outcome expectations related to exercise compared to those in the Tx1 or UC groups.
- Participants exposed to the full Exercise Plus Program will have stronger self-efficacy and outcome expectations related to exercise, increased exercise behavior and more activity compared to those in the other three groups.

## Findings...

A total of 209 women were enrolled in the study. The majority of the participants are Caucasian (97%), and the average age of the participants is 84.0 ( $\pm 6.9$ ). Preliminary findings show some positive trends in terms of the effectiveness of the Exercise Plus Program on improving adherence to exercise. Participants exposed to any of the treatment groups reported more time exercising and engaging in physical activity, less fear of falling at 6 months, better function at 2 months for those in the exercise only and exercise plus groups, and better function at 6 months for those in the Exercise only and Plus only groups. Participants in treatment groups were more likely to report that they intended to initiate an exercise program in either the next 30 days or the next 6 months.

Qualitative work throughout the course of the study helped to identify areas in which the intervention could be improved to better facilitate behavior change. Moreover, specific issues related to behavior change among older adults (i.e., cognitive issues and physical problems such as sensory changes) were noted and the interventions may need to be adjusted to better meet the needs of individuals with these specific impairments.

## Implications and Future Directions ...

These findings provide some support for both theories used in the development of the interventions. In addition, although results are preliminary there is some support to suggest for ongoing monitoring of outcomes to establish if these benefits will last over time. In addition, it is possible that inoculation treatments may be needed to not only help those who are exercising to continue to do so, but to help those who report an intention to exercise to actually initiate exercise.

In addition to the completed qualitative study, several additional studies have been added to the funded project, such as a longitudinal follow-up of participants 2 years post

fracture (and a year after completing the Exercise Plus Program), assessment of treatment fidelity, and exploration of quality of life post hip fracture using the Schedule for the Evaluation of Individual Quality of Life questionnaire framework. The longitudinal study will describe adherence to exercise, overall function, self-efficacy and outcome expectations, mood, quality of life, and the resilience of the individual. This additional work will serve as the basis for future research testing interventions to increase exercise post hip fracture over a longer period of time than in the current study, and address the challenges to long term behavior change.

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# University of Michigan

## Project Name ...

*Tailored Interventions for Multiple Risk Behaviors*

## Funding Sponsor ...

National Cancer Institute  
[ Grant No. 1 R01 CA80696-01 ]

## Principal Investigator ...

Victor J. Strecher, Ph.D.  
Health Media Research Laboratory  
University of Michigan

## Project Summary ...

A significant portion of premature morbidity and mortality can be prevented by lifestyle modification. Unfortunately, most health risk behaviors (e.g., cigarette smoking, poor diet, and sedentary lifestyle) have been studied in isolation. Individuals with multiple risk behaviors may be confused about the relative importance of each risk behavior, or may feel overwhelmed by the sheer number of health habits they need to improve. Since many individuals have multiple health risk behaviors, methods for addressing multiple behaviors should be further developed and tested.

The University of Michigan's Health Media Research Laboratory (HMRL), in collaboration with Henry Ford Health System (HFHS), evaluated the impact of a longitudinal computer-based tailored print intervention and complementary web-based tailored telecounseling intervention among nearly 3,000 HMO enrollees. Unique features of the project included: 1) use of multiple eHealth strategies, including the web, computer-tailored print, and the electronic medical record; 2) interaction of eHealth tools with a trained health specialist; and 3) implementation in a realistic, generalizable setting.

## Research Design ...

Individuals aged 21-70 ( $N=2,949$ ) who engaged in two or more targeted risk behaviors — any combination of cigarette smoking, low vegetable consumption, or sedentary behavior — were eligible for the study. A randomized, 2 x 2 factorial trial was conducted to determine the effectiveness of tailored print and telecounseling interventions, both individually and in combination, in achieving behavior change in the three targeted health risk behaviors.

All participants first completed an initial "gateway section," which assessed their level of vegetable consumption, smoking status, and level of physical activity. If a participant engaged in two or more of these risky behaviors (smoked five or more cigarettes a day, ate less than three servings of vegetables a day, exercised fewer than four times

a week), s/he was eligible to be in the study. Interviewers then prompted participants to choose one risk behavior to target. The remainder of the baseline assessment measured the "psychosocial history" of the targeted behavior (e.g., motivation to change, self efficacy to make a change, benefits of and barriers to change, social support).

During the baseline call, participants were randomized to receive one of four interventions: 1) untailored print materials; 2) tailored print materials; 3) tailored telecounseling sessions; or 4) tailored print materials plus tailored telecounseling sessions. Following the baseline assessment, participants received four treatments over an 18-week period: two and four weeks after baseline, and at two and four weeks after a three-month assessment. Treatments 1 and 3 were longer and more intensive (e.g., 16-page booklet and/or 60-minute structured telecounseling session), whereas treatments 2 and 4 were shorter (e.g., 4-page newsletter and/or 15-minute telecounseling session). Participants completed three- and 12-month assessments, which included behavioral and psychosocial questions about all risk three behaviors.

Participants' first two interventions focused on the initial behavior selected. At the three-month assessment, participants chose either the same behavior or a new for their last two treatments. For those in the three tailored conditions, data from both the baseline and three-month assessments were used to construct the final two tailored print and telecounseling treatments.

## Research Hypotheses ...

- Tailored print materials combined with tailored telecounseling are more effective than either tailored print materials or tailored telecounseling alone in improving at least one health risk behavior. The health risk behaviors include cigarette smoking, poor diet, and sedentary behavior.
- Tailored telecounseling is more effective than untailored print materials in improving targeted health risk behaviors.
- Tailored print materials are more effective than untailored print materials in improving targeted health risk behaviors.

The study also aimed to assess the effects of the interventions in the presence of different combinations of multiple risk behaviors.

## Findings...

Through the 3- and 12-month follow-up periods, the combined tailored print and telecounseling group consistently performed better than all other treatment arms in reducing the number of behavioral risk factors. The combined treatment arm experienced a 15.8% (98.9% to 84.2%) reduction in low vegetable consumption, a 19.4% (96.6% to 77.9%) reduction in sedentary behavior, and a 14.5% (25.5% to 21.8%) in smoking behavior. GEE analyses confirmed a

significant reduction in the three behavioral risk factors in the combined group when compared against the untailored print material condition (OR=1.23 [1.05-1.44]) and marginally significant when compared against either the tailored print only (OR=1.15 [0.98, 1.34]) or telecounseling only (OR=1.13 [0.98, 1.32]) groups. Neither the tailored print nor the telecounseling treatments alone were superior to the untailored print material condition in reducing behavioral risk factors in this population.

### Implications and Future Directions ...

Results of this research suggest the importance of a combination of tailored communication modalities for individuals with multiple risk factors. Tailored programs should be further tested on the Internet, a far less expensive alternative to tailored print materials. These programs should also be examined for their effectiveness in maintaining long-term behavior change.

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## University of Minnesota

### Project Name ...

*The Challenge Study: Theory-Based Interventions for Smoking and Weight Loss*

### Funding Sponsor ...

*National Institute of Neurological Disorders and Stroke [ Grant No. 1 R01 NS38441-01 ]*

### Principal Investigators ...

*Robert Jeffrey, Ph.D.  
Division of Epidemiology  
University of Minnesota*

*Alex Rothman, Ph.D.  
Department of Psychology  
University of Minnesota*

### Project Summary ...

Both smokers and overweight persons report frequent efforts to change their behavior. Long-term success, however, is achieved by few. Interventions are needed to improve long-term success in smoking cessation and weight loss. The Challenge Study was designed to address this need and to test a novel conceptualization of health behavior change based on the premise that the initiation and the maintenance of behavior change involve different decision processes. Positive expectations about the consequences of behavior change were thought to guide decisions to initiate behavior change, whereas satisfaction with the outcomes afforded by one's behavior guided decisions about maintenance. The first phase of the study evaluated the effect people's expectations about the benefits of behavior change had on immediate and long-term behavioral outcomes. Specifically, participants were assigned to an "optimistic" treatment condition that emphasized positive expectations for outcomes or a "balanced" treatment condition that gave equal weight to the benefits and costs associated with behavior change. The impact of manipulating people's expectations about behavior change was examined in the areas of smoking cessation and weight loss.

### Research Design ...

A series of four intervention studies were conducted: Two targeted at smoking cessation (Study 1 and 3); and two targeted at weight loss (Study 2 and 4). Studies 1 and 2 were designed to test the impact of people's expectations about behavior change on initial and long-term behavioral outcomes. Participants were assigned to either an optimistic expectation or balanced expectation intervention condition. The active intervention lasted eight weeks and participants were followed for 18 months. It was predicted that participants in the optimistic condition would be more likely to initiate but less likely to sustain a change in their behavior than would participants in the balanced condition. Studies 3

and 4 were designed to test the impact of how people evaluated the experiences afforded by changes in their behavior on their satisfaction with those changes. Participants were assigned to either a future-focused or a past-focused intervention condition. The future-focused intervention taught people to compare their experiences to what they wanted the behavior change to provide, whereas the past-focused intervention taught people to compare their experiences to what their life was like prior to the change in their behavior. It was predicted that participants in the past-focused condition would be more satisfied with their experiences and consequently more likely to sustain the change in their behavior over time.

### Research Hypotheses ...

This study proposed that decisions regarding behavioral initiation and behavioral maintenance reflected different decision criteria. Specifically, the decision to initiate a new change in behavior was a function of people's expectations of the processes and outcomes associated with the new behavior; people took action only if they believed that the new behavior would afford a set of experiences that were meaningfully better than those afforded by their current pattern of behavior. Decisions regarding whether to maintain a behavior were predicted to rest on people's satisfaction with the outcomes afforded by the new pattern of behavior. Moreover, people's feelings of satisfaction were predicted to be contingent on the degree to which their experiences met their expectations. It was also suggested that optimistic expectations regarding the outcomes afforded by a new pattern of behavior may have motivated people to initiate a change in behavior but undermined their desire to maintain behavior over time.

### Findings...

#### • Sample Characteristics (Smoking):

Participants ( $n=529$ ) were randomly assigned to one of two conditions. Participants ranged in age from 18 to 84 ( $M=47.5$ ,  $SD=11.7$ ), were primarily Caucasian (95.0%), relatively well educated (85.9% had completed at least some college), and were nearly equally split by gender (54.1% female). Participants had smoked for an average of 28.3 years ( $SD=12.4$ ) at a mean rate of 22.3 ( $SD=10.5$ ) cigarettes per day.

- **Studies 1 and 3 (Smoking):** Although the intervention did not have the predicted main effect on participant's expectations, results did provide partial support for our hypotheses. Those smokers who were led to hold more favorable expectations about the processes and outcomes associated with cessation, namely self-efficacy beliefs, were more likely to initiate cessation. Moreover, the intervention's ability to influence smokers' expectations about cessation was contingent on their prior cessation success. The intervention had the intended effect for those who previously had

some success quitting smoking, such that the message that focused on the positive aspects of cessation elicited more favorable expectations than did the balanced message. However, the opposite effect was observed for those smokers who previously had limited cessation success. In this case, the intervention message that focused on both the positive and negative aspects of cessation elicited more favorable expectations.

#### • Sample Characteristics (Weight Loss):

Participants interested in losing weight were screened over the phone to verify that they were at least 18 years of age, in good health, and at least 30-100 pounds over ideal weight for height. The resulting sample ( $N=349$ ) was 18-66 years of age ( $M=46.9$ ,  $SD=8.6$ ); primarily White (89.1%); mainly female (86.7%); married (64.5%); and college-educated (59.3%). The sample was obese on average at baseline, with a mean weight of 93.8 kg (range = 66.6-136.4 kg) and a mean BMI of 35 (range=27-49).

- **Studies 2 and 4 (Weight Loss):** The experimental treatment was successful in changing initial outcome expectations early in the treatment program, such that participants in the balanced group focused more on negative aspects of weight loss. Although the treatment group differences in expectations were strong at week 4, they became weak to non-existent by week eight. Contrary to hypotheses, there were significant differences in weight change between the two treatment groups.

Correlational analyses provided some support for the idea that expectations and satisfaction could be key factors in weight loss. It was determined that that expectations of change at week four were significantly associated with weight loss at week eight, and more favorable expectations were associated with better weight loss. A distinctive feature of this study was the finding that, over time, individuals who were more satisfied than others lost weight, and participants who increased their own satisfaction over time also lost weight.

### Implications and Future Directions ...

**Smoking Cessation:** Contrary to predictions, favorable expectations undermined neither smoking cessation satisfaction nor cessation maintenance. Regardless of expectations, successful abstainer's satisfaction with cessation influenced whether they remained smoke free from the end of the formal intervention program to 6 months after the quit date. The observation that satisfaction did not account for remaining smoke free from 6 to 16 months after the quit date suggests that its impact on decision-making may dissipate across the maintenance phase of behavior change.

**Weight Loss:** This study was motivated by a new theoretical perspective suggesting that different processes underlie the initiation and maintenance of weight loss. Although correlational data afforded some evidence for these different processes, the experimental manipulation of participants' expectations did not influence weight control. Given this mixed set of findings, it is possible that the theory is wrong either in part or in totality. It is important to note that weight loss requires a complex series of repeated behaviors over time that are subject to a variety of physical, social, environmental, and psychological influences. Future research on the determinants of weight loss and weight maintenance will provide the evidence needed to make a more thorough assessment.

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# University of Rhode Island

## Project Name ...

*A Study of Exercise and Nutrition in Older Rhode Islanders:  
The SENIOR Project*

## Funding Sponsor ...

*National Institute on Aging  
[ Grant No. 1 R01 AG16588-01 ]*

## Principal Investigator ...

*Phillip G. Clark, Sc.D.  
Program in Gerontology  
University of Rhode Island*

## Project Summary ...

Innovative and effective health promotion interventions targeted on older adults within a public health framework will be increasingly important as the US population ages dramatically. The benefits of healthier lifestyles for older adults include increased functional ability and improved quality of life. The SENIOR Project represented a multibehavioral health promotion intervention for community-dwelling older adults focusing on increasing exercise and fruit and vegetable consumption. Intervention materials were stage-tailored for each individual, and included manuals, newsletters, expert system assessments and reports, and telephone coaching. The primary purpose of the SENIOR Project was to investigate the relative effectiveness of a multiple behavior intervention—based on a single theoretical framework—compared to single-behavior interventions. The secondary purposes were to investigate the intervention's effects on both functional ability and general health outcomes, and how older adults moved along a continuum of changing health behaviors. The Transtheoretical Model of Behavior Change (TTM), the conceptual framework for the SENIOR Project, was chosen for its performance potential with older adults; individual tailoring on a stage basis; technological features; and interdisciplinary research base and community partnership.

## Research Design ...

The SENIOR study was a 12-month 2 x 2 experimental design with the following groups: exercise intervention only (Tx1); nutrition intervention focusing on fruits and vegetables (FV) only (Tx2); combined Tx1 and Tx2 (Tx3); and a comparison group receiving fall prevention materials. Intervention components for Tx1, Tx2 and Tx3 included stage-based manuals (for exercise and/or FV); monthly

stage-based newsletters (for exercise and/or FV); expert system feedback report; and stage-based telephone coaching by trained counselors. Outcomes were assessed at baseline, 12 and 24 months, and focused on four central TTM constructs: stages of change, decisional balance, processes of change, and situational self-efficacy.

## Research Hypotheses ...

The primary purpose of the SENIOR project was to investigate the relative effectiveness of a TTM-based multiple behavior intervention (exercise and nutrition) compared to single-behavior interventions. Secondary aims were: 1) to investigate the interventions' effects on both functional ability and general health outcomes; and 2) to investigate how older adults move along a continuum of changing their health-related behaviors.

## Findings ...

- **Sample Characteristics:** Participants (N=1,276) were primarily female (69.6%); married (46.7%) or widowed (37.2%); high school educated (38.4) or greater (38.9%); with a mean age 75.7 years. The sample was 77.3% White, 13.9% Portuguese/Cape Verdean, 2.1% Black, and 6.2% Other.
- **Baseline:** The results from baseline data analyses confirm earlier studies that the stage paradigm of behavior change is relevant to older adults. Although more than half of the sample was in action and maintenance for exercise (55.1%) and fruit and vegetable consumption (64.8%), there were still substantial percentages in preaction for both behaviors: 44.9% for exercise and 35.2% for fruit and vegetable consumption.
- **Exercise:** The exercise intervention did not appear to be effective in increasing physical activity or improving function status, particularly for those who were already active. The intervention proved more successful for those who were inactive at baseline (39.4% progressed to action/maintenance).
- **Fruits and Vegetables:** The nutrition intervention was effective across all time points. Most progress occurred in the first 12 months of the intervention. Approximately 78% maintained nutrition goals of five-a-day or progressed to action/maintenance.
- **Multibehavioral:** No significant difference in the proportions of individuals in the action/maintenance stage for either exercise or nutrition. This finding indicates that participants

in Tx3 were not disadvantaged by overburdening, nor did they differentially benefit from enhancement. No main or interaction effects were found for exercise groups; however, the proportion of individuals in the action/maintenance stages increased continually from baseline to 24 months. Significant positive main and interaction effects were found for nutrition groups with fewer than 12% stage regressions at 24 months (compared to 32% for exercise).

### Implications and Future Directions ...

Further insight into the questions of whether there are gateway behaviors in older adults, and whether intervening in two behavioral domains simultaneously will enhance or detract from the efficacy of the intervention should continue to be explored. Analyses of the baseline data underscore the importance of further and continued research into the interrelationships between motivation and readiness to adopt healthy lifestyle behaviors in older adults and into the most effective methods of promoting both increased physical activity and better nutrition in this rapidly growing population.

### Publications ...

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Riebe, D., Garber, C. E., Rossi, J. S., Greaney, M. L., Nigg, C. R., Lees, F. D., Burbank, P. M., & Clark, P. G. (2005). Physical activity, physical function, and stages of change in older adults. *American Journal of Health Behavior, 29*(1), 70-80.

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Greaney, M. L., Lees, F. D., Nigg, C. R., Saunders, S. D., & Clark, P. G. (2006). Recruiting and retaining older adults for health promotion research: the experience of the SENIOR Project. *Journal of Nutrition for the Elderly, 25*(3-4), 3-22.

## University of Rochester

### Project Name ...

*Self-determination, Smoking, Diet and Health  
(The Smokers' Health Study)*

### Funding Sponsor ...

*National Institute of Mental Health;  
National Cancer Institute  
[ Grant No. 1 R01 MH59594-01 ]*

### Principal Investigator ...

*Geoffrey Williams, M.D., Ph.D.  
Department of Medicine;  
Department of Clinical and Social Psychology  
University of Rochester*

### Project Summary ...

Tobacco use and diet related to cholesterol contribute to over 700,000 premature deaths in the U.S. each year. The Public Health Service Guidelines for Treatment of Tobacco Dependence assert that autonomy is needed for effective treatment; however, autonomy has never been demonstrated to predict change. Self-determination theorists hypothesize that perceived autonomy and perceived competence motivate abstinence from tobacco and adhering to diet to improve cholesterol.

The Smokers' Health Study (SHS) tested a Self-Determination Theory (SDT) model of maintained smoking cessation and diet improvement, and an SDT intervention, relative to usual care, for facilitating maintained behavior change and decreasing depressive symptoms for those who quit smoking. SDT is the only empirically derived theory that emphasizes patient autonomy and has a validated measure for each of its constructs, and this was the first trial to evaluate an SDT intervention. Adult smokers were stratified for whether they are at National Cholesterol Education Program (1996) recommended goal for low-density lipoprotein cholesterol (LDL-C). Those with elevated LDL-C were studied for diet improvement and smoking cessation. Six-month interventions involved a behavior-change counselor using principles of SDT to facilitate autonomous motivation and perceived competence for healthier behavior. Cotinine-validated smoking cessation and LDL-C-validated dietary recall of reduced fat intake, as well as depressive symptoms, were assessed at six and 18 months. Structural equation modeling was used to test the model for both behaviors within the intervention and usual-care conditions.

### Research Design ...

SHS was an 18-month trial that randomized subjects who smoked five or more cigarettes per day (excluding those under 18 years of age, those with major psychiatric illness, those not speaking or reading English, and those not expected to live for 18 months) into one of five groups based on smoking and cardiovascular risk. Patients were recruited into this cessation induction trial whether or not they wanted to quit. The groups were:

- **Group 1:** Low CV risk (at or below NCEP II goal for cholesterol) — Community Care
- **Group 2:** Low CV risk — Intensive tobacco dependence treatment (TDT)
- **Group 3:** High CV risk — Community care for both cholesterol and TDT
- **Group 4:** High CV risk — Community Care for cholesterol and Intensive TDT
- **Group 5:** High CV risk — Intensive dietary treatment for cholesterol and Intensive TDT

Intensive TDT included four visits with a health counselor over six months plus community care. Intensive dietary treatment involved two visits with a dietician in addition to the visits with the tobacco counselor. Patients were asked to obtain two Fasting Lipid Profiles (FLPs) in the week prior to coming for the first study visit. Patients were randomized based on whether or not they were at the NCEP II goal for cholesterol. Patients were given their two cholesterol reports to take back to their own physicians. All participants were asked to complete questionnaires at baseline, one, six, and 18 months. Dietician visits were recommended for all participants in Group 5. The dietician was trained to deliver the nutritional guidelines in NCEP II and then NCEP III for patients with elevated cholesterol and consistent with the patients other medical problems (e.g., hypertension or diabetes) in an autonomy supportive manner.

### Research Hypotheses ...

The SHS assessed the utility of self-determination theory for understanding the maintained change of two interrelated behaviors—cigarette smoking and poor diet—that put people at significant risk for cardiovascular heart disease (CHD) and other illnesses. Specific aims were to:

- evaluate the effectiveness of a self-determination-based intervention for facilitating smoking cessation and diet modification, relative to community care;
- test the self-determination model of health-related behavior change within both the intervention and the usual-care conditions; and
- test the hypothesis that the self-determination intervention will counteract the tendency for people who quit smoking to become depressed.

### Findings...

- **Sample Characteristics:** From the 2,681 smokers who contacted the study, a total of 1,006 individuals were enrolled in the SHS. These individuals smoked more than 4 cigarettes per day, were over 18 years of age, spoke and read English, and presented without a psychotic disorder. Seventy-eight dropped out, 6 died, and 305 were lost to follow-up.
- Intention to treat analyses revealed that the intervention significantly increased 12-month prolonged abstinence and reduced LDL-C. There was no significant effect on % calories from fat.
- Intervention patients perceived greater autonomy support and reported greater autonomous and competence motivations than did control patients. They also reported greater medication use and significantly greater abstinence. SEM analyses confirmed the SDT process model in which perceived autonomy support led to increases in autonomous and competence motivations, which in turn led to greater cessation. The causal role of autonomy support in the internalization of autonomous motivation, perceived competence, and smoking cessation was supported.
- Motivation for cessation, use of medications, serious quit attempts, and long-term abstinence were all significantly increased for those in the intensive intervention compared to smokers treated in the community. This was true whether the participants intended to quit smoking or not at the start of the trial. These findings have implications for extending tobacco interventions for all smokers, and suggest that the use of medications can be increased through autonomy supportive counseling about health benefits of cessation, and medication risks and benefits.

### Implications and Future Directions ...

These findings confirm that patients autonomy and competence and providers autonomy support are important predictors of cessation within a self-determination theory-based intensive intervention for tobacco dependence. This confirms their importance for the PHS guidelines.

NIH funding was received in 2004 to continue this research. In addition to greater emphasis on medications and examination of medication adherence as a mediator of maintained cessation, two major changes to the intervention are intended to facilitate long-term maintenance. First, the intervention will extend over 12 months, with meetings during the additional time focusing on maintenance and relapse prevention. Second, at least one family member or best friend of each patient will be encouraged to meet with a

counselor to learn how to be more autonomy supportive with the patient around issues related to tobacco. Cessation and maintained abstinence will be examined with logistic regression and survival curve analyses. The SDT process model of maintained cessation will be tested using structural equation modeling, and cost-effectiveness analyses will be done for the interventions.

### Publications ...

- Williams, G. C., Minicucci, D. M., Kouides, R. M., Levesque, C. S., Chirkov, V. I., Ryan, R. M., & Deci, E. L. (2002). Self-determination, smoking, diet, and health. *Health Education Research*, 17(5), 512-521.
- Williams, G. C., Levesque, C. S., Zeldman, A., Wright, S., & Deci, E. L. (2003). Health care practitioners' motivation for tobacco dependence counseling. *Health Education Research*, 18, 538-553.
- Williams, G. C., McGregor, H. A., King, D., Nelson, C. C., & Glasgow, R. E. (2005). Variation in perceived competence, glycemic control, and patient satisfaction Relationship to autonomy support from physicians. *Patient Education & Counseling*, 57(1), 39-45.
- Williams, G. C., Markakis, K. M., Ossip-Klein, D., McIntosh, S., Tripler, S., Grady-Weliky, T. (2005). Evidence-based behavior change curriculum for the Ambulatory Clerkship The Double Helix. *Health Education*, 105(2), 145-153.
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- Williams, G. C., McGregor, H. A., Sharp, D. S., Kouides, R., Levesque, C. S., Ryan, R. M., & Deci, E. L. (2006). A self-determination multiple risk intervention trial to improve smokers health. *Journal of General Internal Medicine*, 21(12), 1288-1294.
- Masse, L. C., Allen, D., Wilson, M., & Williams, G. C. (2007) Introducing equating methodologies to compare test scores from two different self-regulation scales. *Health Education Research*, 21(Suppl 1), i110-i20.
- Levesque, C., Williams, G. C., Elliot, D., Bodenhamer, B., & Finley, P. J. (2007) Validating the theoretical structure of the Treatment Self-Regulation Questionnaire (TSRQ) across three different health behaviors. *Health Education Research*, 22, 691-702.

## University of Tennessee, Memphis

### Project Name ...

*Health Opportunities with Physical Exercise (HOPE)*

### Funding Sponsor ...

National Cancer Institute  
[ Grant No. 1 R01 CA80725-01 ]

### Principal Investigator ...

Robert J. Garrison, Ph.D.  
Department of Preventive Medicine  
University of Tennessee, Memphis

### Project Summary ...

Physical activity interventions targeting social and physical environments of the urban poor hold promise in improving health outcomes in underserved communities. This study randomly assigned overweight, sedentary, economically disadvantaged adults to one of three intervention conditions at The Hope and Healing Center, a large inner-city health facility providing numerous options for exercise. Within the tenets of Social Action Theory, the HOPE trial tested the efficacy of two behavior change models—social support and patient-provider interaction—to increase physical activity. In addition to a standard care condition participants were assigned to one of two behavior-change interventions, either peer support or provider support. Intervention conditions were compared on psychosocial mediators including motivational appraisals, ratings of social support, rapport, problem solving and self-efficacy for overcoming barriers to increased physical activity. Novel aspects of this intervention included: 1) delivery of socially based physical activity interventions to an economically disadvantaged urban population; 2) reduction of environmental barriers to be physically active; and 3) emphasis on social interactions influencing health habit change.

### Research Design ...

Participants ( $N=361$ ) were randomly assigned to one of three groups: 1) standard care (SC, exercise facility); 2) exercise facility plus peer support (Peer); or 3) exercise facility plus provider support (Provider) in order to increase physical activity. Those assigned to Group 2 received face-to-face, systematic and scheduled encouragement from study-trained "peer" interventionists at the facility. Participants assigned to Group 3 received face-to-face, systematic and scheduled encouragement provided by

study-trained “provider” interventionists also at the facility. The primary outcomes of change in exercise behavior were documented by self-reported physical activity and confirmed by fitness testing at baseline, six, 12 and 24 months during one year of active intervention and one year of relapse prevention follow-up.

### Research Hypotheses ...

The HOPE trial was intended to serve low-income African-American women. It was designed to compare two theoretical models that emphasize the importance of social influence in prompting behavior change. Social Support Theory and Patient-Provider Communication Theory were tested as viable models of socially oriented physical activity change based on tenets of Social Action Theory and Social Cognitive Theory. The HOPE intervention introduced social interaction processes to a novel environmental context to increase physical activity levels in previously sedentary, overweight persons. Social Action Theory posits that such social and environmental factors are necessary for behavior change.

### Findings ...

- **Sample Characteristics:** Participants had a mean age of 44 years (range 25-65), with a mean BMI=37. Approximately 88% were female; 72% African American and 25.5% White.
- After controlling for baseline age, weight, gender, race, and health, Rockport one-mile walk test results showed a trend for improvement in  $V_{O_2}Max$  by one-half unit per year over 24 months (+.5379,  $p=.0477$ ) regardless of group assignment (i.e., one unit fitness improvement after 2 years of intervention).
- Improvements in scores on the Kaiser Physical Activity Survey were seen for both sports and active living (+ 2.2151/yr.,  $p<.0001$  and +.1582/yr.,  $p<.0001$ ), but not for occupational or caregiver indexes.
- Results from the YALE Physical Activity Survey found that the Activity Dimensions Summary Score comprised of vigorous activity, leisure walking, moving, standing, and sitting increased on average +3.0162/yr.,  $p=.0001$ .
- Stress levels were not significantly lower in the SC and Peer groups compared to Provider throughout ( $p=.0668$ ), although there were non-significant trends for decreases in stress in SC (SC< Provider, -1.19954,  $p=.1804$ ) and Peer (Peer< Provider, -1.4701,  $p=.1042$ ).
- BMI was found to increase on average, +.2332 units per year,  $p=.0120$ .

### Implications and Future Directions ...

Providing free access to a state of the art wellness facility — The Hope and Healing Center — was sufficient to achieve increases in facility-based and lifestyle activities without the need for extra support from a peer or provider. Weight gain was minimized in this high-risk population, while perceived stress seemed unrelated to the intervention.

### Publications ...

- Coday, M., Klesges, L. M., Garrison, R. J., Johnson, K. C., O'Toole, M., & Morris, G. S., (2002). Health Opportunities with Physical Exercise (HOPE): Social contextual interventions to reduce sedentary behavior in urban settings. *Health Education Research*, 17(5), 637-647.
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# Cross-site **CHALLENGE** grants

## Conceptual Mediators Workgroup

### Project Title:

*Cross-site Analysis of the Self-Determination Theory Process Model of Health Behavior Change*

### Lead Institution:

*University of Rochester*

### Principal Investigator:

*Geoffrey Williams, M.D., Ph.D.*

### Participating Sites ...

*Emory University  
Oregon Health and Science University  
Oregon Research Institute  
Stanford University School of Medicine  
University of Michigan  
University of Rochester  
University of Tennessee, Memphis*

### Significance ...

When researchers interested in motivational constructs examine the process of behavior change it is extremely important that they rely on measures of antecedents which can accurately capture the process of change in individuals and how this change in motivation effect behavior change. Seven BCC sites collected data on patients' perceptions of autonomy and health behavior change (smoking, exercise and/or diet), with some sites also measuring competence, autonomy support from the intervention providers, and depressive symptoms. The need exists to formally and empirically examine the validity of the constructs of motivation and competence across various health behaviors. There is also a need to empirically assess the validity of a common motivational model of health behavior change.

This cross-site research effort allowed us to: 1) improve the measurement of motivation, competence, and autonomy support across various health behaviors; 2) increase our knowledge of the process by which motivational variables foster behavior change for a variety of health behaviors; 3) examine the extent to which this process is similar across health behaviors and thus allow us to examine behavior change intervention effectiveness across different health behaviors; and 4) examine autonomy support as a psychosocial mediator of this process of change across various health behaviors.

### Research Aims ...

The main purpose of the present project is to conduct a cross-site analysis of the Self-Determination Theory (SDT) model of health behavior change and the relation of the SDT motivational process variables to depression and health behavior outcomes. In our own research, this model has been supported for smoking behavior. In order to test the SDT process model of health behavior change across different health behaviors it was important to first establish the validity and the equivalence of the motivational constructs across the three health behaviors. Thus, the first research question concerned the measurement and conceptual equivalence of the motivational measures (autonomy, competence, and autonomy support) across the three health behaviors examined (smoking, exercise, and diet).

A second research question concerned the test of the equivalence of the SDT process model of behavior change across the three health behaviors (smoking, exercise and diet). In this project we want to expand on the SDT process model to include depression and the assessment of the different behavior change interventions across the seven sites. The revised process model suggests that behavior change interventions are perceived by participants as more autonomy supportive which in turns enhances patients' autonomous and competence motivations. Increased perceptions of autonomy and competence toward behavior change would then leads to better behavioral health outcomes over time as assessed by a greater number of quit attempts and a greater number of days of cigarettes, better diet, and increased exercise. The process model was tested for each individual health behavior using corresponding change in behavioral health outcomes and will also be tested for the combined outcome of reduction of 30-year mortality.

Changes in perceived autonomy and competence were assessed as predictors of change in depressive symptoms over time. As part of the process model of behavior change, adherence to the behavioral regimen for the three different health behaviors were tested as a mediator between perceived autonomy and development of depressive symptoms.

### Summary Abstract ...

Self-regulated health behavior is a social process. The Treatment Self-Regulation Questionnaire (TSRQ) concerns why people engage in healthy behavior, enter treatment for a medical condition, or try to change an unhealthy behavior. The TSRQ, which has been used in previous research to assess the many reasons for engaging in various health behaviors, taps into four different types of motivations proposed by Deci & Ryan (2000): identification, introjection, external regulation, and amotivation. Although theoretically derived, the factorial structure of the TSRQ was not formally validated. The purpose of the present research was twofold: 1) validate the theoretically proposed four factor structure with the use of Confirmatory Factor Analysis (CFA) and 2) assess the factorial equivalence (invariance) of the TSRQ across three health behaviors (diet, smoking, and exercise) with data collected from four different sites across the United States. A total of 2,731 participants completed the TSRQ.

Results of CFA analyses revealed that the proposed 4-factor structure of the TSRQ was supported for all sites and all three health behaviors assessed. Confirmatory Fit Indices (CFI) ranged from .94 to .97, Goodness of Fit Indices (GFI) ranged from .88 to .94, and Root Mean Square of Approximation (RMSEA) ranged from .09 to .07. In addition, all items significantly loaded on their respective factor. Invariance analyses revealed that the factorial structure of the TSRQ was equivalent across all three health behaviors assessed. Results of the present research provide evidence for the validity and generalizability of the TSRQ.

### *Publications...*

Levesque, C., Williams, G. C., Elliot, D., Bodenhamer, B., & Finley, P. J. (2007) Validating the theoretical structure of the Treatment Self-Regulation Questionnaire (TSRQ) across three different health behaviors. *Health Education Research*, 22, 691-702.

## *Motivational Interviewing Workgroup*

### *Project Title:*

*Training Coders to Use the Motivational Interviewing Treatment Integrity Coding System*

### *Lead Institution:*

*Emory University*

### *Principal Investigator:*

*Ken Resnicow, Ph.D.*

### *Participating Sites ...*

*Emory University  
Harvard School of Public Health  
Oregon Health & Science University  
Oregon Research Institute  
University of Rochester*

### *Significance ...*

Motivational Interviewing (MI) is a directive, patient-centered counseling style that is currently being used to promote healthy behavior changes in many settings. While MI is a well used approach based on well defined principles there is little published research on the fidelity of behavior change interventions to the MI model. By coding a subset of tapes from five sites of the Behavior Change Consortium, we can evaluate the fidelity of MI and factors that may effect delivery of an MI intervention (i.e. phone vs in person, counselor training, scripted interventions). The comparison among BCC sites and discussion of findings will allow a broader understanding of MI, approaches needed for improving intervention fidelity and how fidelity to the MI model maybe affected by intervention delivery methods. Information from this study will be important to investigators planning future research using MI.

### *Study Aims ...*

**Aim 1A:** Establish methodology to code MI interactions using the Motivational Interviewing Treatment Integrity (MITI) coding system developed by Theresa B. Moyers, Tim Martin, Jennifer K. Manuel and William R. Miller at the University of New Mexico, and train, maintain and monitor coders with acceptable accuracy and reliability.

**Aim 1B:** Code approximately 300 total interactions from 5 sites, which will represent interactions selected from study subjects who were changers (made more than 0.5 SD increase in daily fruit and vegetable [F/V] intake or quit

smoking) and non-changers (made less than 0.25 SD increase in F/V intake per day or did not quit smoking).

**Aim 1C:** Determine fidelity of the MI interactions in five studies by comparing the coding results with expertly defined MI fidelity criteria.

**Aim 1D:** Relate MI content (fidelity and dose) to changes in fruit and vegetable intake and smoking behavior.

**Aim 2:** Relate MI content and fidelity to counselor background, training and intervention setting.

### Results ...

Six coders at OHSU were trained to code MI interactions using the Motivational Interviewing Treatment Integrity (MITI) coding system. A description of the coder training and reliability assessment has been tentatively accepted for publication in *Motivational Interviewing Newsletter: Updates, Education & Training*. Two other reports have been published, including one that was presented at the Motivational Interviewing Network of Trainers Annual Meeting in Portland, Maine:

- DeFrancesco, C., & Ernst, D. Coding experiences from the field. Proceedings of the Annual Meeting of the Motivational Interviewing Network of Trainers, October 28-30, 2004, Portland, Maine. *MINT Bulletin*, 12. 1, 48-49.
- DeFrancesco, C., & Breger, R. Reflections on coding. *MINT Bulletin*, Vol. 11, No. 3, 17, Motivational Interviewing Newsletter: Updates, Education & Training, October 2004, 17.

Assessment of coder reliability followed standard methodology. A site's tapes were coded as a group, and because of the potential of site-specific factors, coders' reliability was repeated with site-specific tapes prior to coding each site's tapes. To establish reliability for each site, five 20-minute session segments (not subsequently selected for analysis) were coded independently, randomized as to their order. A rating matrix of correlations for each dimension across coders was used to obtain an internal consistency reliability coefficient. As a check of external validity, reliability also was measured between coders and with a single coder from the University of New Mexico, and coders also achieved acceptable reliability.

Coders trained for forty hours over 13 weeks to establish reliability. Over a 5 month period, 291 tapes were coded for data analysis and 25 tapes were coded to measure ongoing reliability.

Coding results from the MI sessions were compared with the expertly defined MI fidelity criteria from University of New Mexico. These results were presented to members of the MI Workgroup at the BCC Nutrition Working Group meeting in Skamania, OR, July 2004.

One major challenge is that we were not able to code the full dose of MI that each subject selected for analysis received. Not all sessions were recorded or sent for coding for each participant in the data set. Given the incomplete nature of the subject based data, we will not be able to

perform a subject-based, dose response analysis to relate MI content with behavioral outcomes.

The MI coding data set is complete, and we can describe the intervention setting and counselors that delivered the intervention for each site. We will also examine coding results by counselor to determine if counselors are performing consistently with different participants.

### Publications...

- Hecht, J., Borrelli, B., Breger, R. K., Defrancesco, C., Ernst, D., & Resnicow K. (2005). Motivational interviewing in community-based research: Experiences from the field. *Annals of Behavioral Medicine*, 29(Suppl), 29-34.
- Resnicow, K., Dilorio, C., Soet, J. E., Ernst, D., Borrelli, B., & Hecht, J. (2002). Motivational interviewing in health promotion: It sounds like something is changing. *Health Psychology*, 21(5), 444-51.

## Nutrition Workgroup

### Project Title:

*Eating Patterns in a Multi-Site Behavioral Intervention*

### Lead Institution:

*University of Rhode Island*

### Principal Investigator:

???

### Participating Sites ...

*Emory University  
Harvard School of Public Health  
Illinois Institute of Technology  
University of Rhode Island  
University of Rochester*

### Significance ...

Eating patterns encompass a large range of variables that cut across meal patterns (i.e., by type, location, and frequency), food-level behaviors (e.g., choosing low-fat foods), energy and nutrient intake, dietary patterns (e.g., prudent diet vs. healthy diet). It is important to be able to quantify these different behaviors in order to provide insight into factors that change in a nutritional health promotion intervention or in relation to risk factors and their putative outcomes.

A growing body of evidence suggests that meal patterns are related to both obesity and energy intake. Part of the link is potentially driven by metabolic factors, where small, frequent meals either increase energy expenditure through the thermogenic effects of food or decrease caloric intake by mechanisms that regulate the quantity of food consumed at any one time. Recent data for adults suggest that the typical pattern of three meals per day is changing to more irregular patterns that are accompanied by an increase in snacks between meals. There is concern that as snacking increases, energy density will increase and nutrient density will decrease — since snacks are often high in fat, sugar and salt — and that this change would exacerbate the growing obesity problem.

Another meal pattern factor that may play a role in weight gain is breakfast skipping, which is associated with an increase in energy intake compared to eating a regular breakfast. It also has been shown that regular meal consumption vs. an irregular consumption pattern results in lower energy intake. A related behavior is the shift over time, in the general population, to eating more meals away from home. Food consumed away from home is likely to make a greater energy contribution due to increases in portion size and energy density.

Historically, a number of observational studies have found an inverse relationship between meal frequency and both energy intake and weight/ relative weight [expressed as body mass index (BMI=weight (kg)/height (m<sup>2</sup>)). This finding is not consistent across all studies, although there are no reports of a positive relationship between these factors. The majority of research on eating patterns has occurred in children and adolescents, with much less known on adults. The research on adults is in many instances conducted with small samples or in very select populations, and the conclusions have been equivocal. The use of 24-hour recall interviews to assess meal patterns in free-living subjects, a methodology that would be less biased relative to food diaries, has been constrained because of limitations in how data is stored and output, which result in time-consuming coding of individual records.

### Aims ...

Five participating sites collected 24-hour recall (24HR) data as part of a dietary assessment validation exercise. This setting provides a study population which is demographically diverse and has a relatively large sample size (635 subjects; 1,748 interviews; 6,768 meals). This study examined how meal patterns and energy intake varied among demographic and lifestyle groupings, and how these factors related to weight.

24HR data were collected using the new NDS-R software, which provides up-to-date, detailed nutrient profiles for the foods reported consumed, as well as multi-level data which range from food components to foods, meals, and interviews. The output datafiles are flexibly structured so that this information can be summarized in a multitude of ways, including our target meal pattern variables. Contained in the meal-level data is information on type of meal (breakfast, lunch, dinner, and snack), location (home, work, purchased, and other), and timing. Coupled with the nutrient data a large group of constructs such as energy derived from snacks can be created. Additionally, data were available for anthropometric measures and the 10-item version Marlowe-Crowne social desirability scale, a known biaser of self-report dietary data, which allows us to examine, and potentially control for the effects of, bias in energy intake estimates.

### Findings ...

The mean number of meals reported per day were 3.9 (*SD*=0.98, range=1.3-8.3). The traditional three main meal pattern was observed in 67% of subjects. This level is lower than has been reported for adults in previous studies, and may indicate an underlying change in regular meal consumption. Breakfast skipping, which was defined strictly as never reporting eating breakfast was uncommon, occurring in only 4% of the study population, while skipping one or more main meal was much more frequent, at 33%. The rate of skipping breakfast is consistent with a recent report that was based on data from an average of 13.4 24HRs and used skipping 75% of breakfasts as their criteria. Twenty-two percent of subjects consumed 2 or more snacks per day, and this did not vary by meal skipping status. Overall, meal frequency is inversely related to BMI (beta = -

0.71,  $p=0.008$ ) in our data. This is consistent with a number of previous reports. This effect is stronger in women ( $\beta = -0.79$ ,  $p=0.02$ ), vs men ( $\beta = -0.48$ ,  $p=0.26$ ) although this difference is not statistically significant. Meal frequency is inversely related to energy intake ( $\beta = -59.2$  kcal/episode,  $p < 0.0001$ ). There is no difference when the analyses were stratified by gender (men  $\beta = -58.2$ ,  $p < 0.0001$ ; women  $\beta = -59.6$ ,  $p < 0.001$ ). Also, we did not observe a difference by age group (18-39, 40-59, and 60+ years). When controlling for age group, meal frequency is inversely related to BMI ( $\beta = -0.70$ ) and energy intake ( $\beta = -54.0$ ), with the only inconsistency seen in the stratified analyses for the 40-59 year group for BMI, where the effect was smaller and did not reach statistical significance. There was no modification by smoking of the effect of meal frequency with BMI and energy intake. Analyses have not been completed and are currently underway. The consistency in the association of meal frequency with BMI and energy intake raise questions about the energy content of meals and snacks, and what sorts of adaptation to energy intake occur in individual who consume a greater number of eating episodes.

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## Physical Activity Workgroup

### Project Title:

*Physical Activity and Environment Relationships*

### Lead Institution:

*Stanford University School of Medicine*

### Principal Investigator:

*Abby C. King, Ph.D.*

### Participating Sites ...

*Oregon Research Institute  
Stanford University School of Medicine  
University of Michigan  
University of Rhode Island  
University of Tennessee, Memphis*

### Significance ...

Despite more than two decades of intervention development aimed at increasing regular physical activity (PA) levels in the U.S. and abroad, population-wide levels of PA have remained relatively unchanged or, in some nations, have declined. Although, a number of interventions aimed at changing individual or group-conducted PA have been found to be effective, it is increasingly clear that personal-level interventions will need accompanying changes in the environment to increase the likelihood of sustained behavior change.

Evidence of consistent associations between PA and perceived and objectively measured physical environmental variables has increased dramatically over the past decade; yet, there remains much to be learned concerning environmental influences on PA performed for different purposes (e.g., leisure, transport, occupation, household) as well as how environmental/PA relationships may differ across population segments. Given what appear to be the unique contributions of perceived environment as well as objectively measured environmental factors on PA, both types of environmental variables deserve further systematic study.

While environmental factors have received increasing attention in the physical activity field, few studies have explored how perceived environmental variables, measured in a uniform manner, may be related to different forms of PA (e.g., leisure, transport, occupation, household) across different population segments (e.g., women, older adults, different ethnic and income groups). This study explored this issue in five NIH Behavior Change Consortium-funded

physical activity intervention trials that collected similar environmental and physical activity information.

### Aims ...

Standardization of perceived environmental and PA instruments across five BCC studies allowed for the investigation of different domains of both the perceived environment and PA across a regionally and demographically diverse set of adult samples. The current investigation had the following objectives:

- Assess the cross-sectional relationships between multiple perceived environmental variables and PA domains in the five different adult samples; and
- Examine whether the perceived environmental variables moderated the effects of PA interventions.

This is among the first studies to investigate perceived environment variables as potential moderators of PA intervention effects.

### Findings ...

Cross-sectional pooled data analysis indicated that people who met current national physical activity recommendations reported living in neighborhoods with more attractive scenery and ease of walking compared to those not meeting recommendations. Within-site multiple regression analyses identified two additional neighborhood variables—seeing or speaking to others when walking and loose or stray dogs making it difficult to walk—as correlates across multiple sites and PA domains (i.e., minutes of weekly moderate or more vigorous PA, walking for errands, walking leisurely). Moderator analyses suggested that traffic safety variables might play a particularly important role in facilitating or impeding attempts to become regularly active as part of a formal PA intervention. In 3 study samples, people with few concerns about traffic safety increased their physical activity more in response to interventions than people who had more traffic safety concerns. The relationships between perceived environments and physical activity may differ depending upon the population groups and PA domains being investigated.

### Publications...

- Nigg, C., Hellsten, L., Norman, G., Burbank, P., Braun, L., Breger, R., Coday, M., Elliot, D., Garber, G., Greaney, M., Keteyian, S., Lees, F., Matthews, C., Moe, E., Resnick, B., Riebe, D., Rossi, J., Toobert, D., Wang, T., Welk, G., & Williams, G. (2005). Physical activity staging distribution: Establishing a heuristic using multiple studies. *Annals of Behavioral Medicine*, 29 [Suppl], 34-45.
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## Treatment Fidelity Workgroup

### Project Title:

*Enhancing Treatment Fidelity in Clinical Outcome Studies.*

### Lead Institution:

*Brown Medical School /The Miriam Hospital*

### Principal Investigator:

*Belinda Borrelli, Ph.D.*

### Participating Sites ...

*Brown Medical School /The Miriam Hospital  
Weill Medical College / Cornell University  
University of Illinois  
University of Maryland*

### Significance ...

Treatment fidelity refers to the methodological strategies used to monitor and enhance the reliability and validity of behavioral interventions. The overall goal of enhancing treatment fidelity is to increase scientific confidence that changes in the dependent variable are attributable to the independent variable. Careful consideration of treatment fidelity helps to explain study findings, revise interventions for future testing, and increase statistical power and effect size by reducing random and unintended variability. Enhancing treatment fidelity has the effect of not only increasing internal validity but also increasing external validity, as a high degree of treatment fidelity is needed both for study replication and for generalization of treatments to applied settings. For treatments to be adopted by clinicians and/or integrated into existing infrastructures, information about method, fidelity, and effectiveness is needed.

### Aims ...

This administrative supplement from NHLBI allowed the BCC's Treatment Fidelity Workgroup to identify treatment fidelity concepts and strategies in health behavior intervention research. The study aimed to:

- Develop a set of treatment fidelity guidelines that could be used to assist NIH grant reviewers as well as journal editors in reviewing; and
- Evaluate treatment fidelity across 10 years of published research.

### Findings ...

The model of treatment fidelity includes: (1) design (e.g., is the study consistent with the underlying theory); (2) training (e.g., provider skill acquisition and maintenance); (3) delivery (e.g., was the intervention delivered as intended); (4) receipt, (e.g., did the participant understand the intervention), and (5) assimilation, (e.g., is the participant able to incorporate the new knowledge in their every day life).

The work group reviewed treatment fidelity practices in the research literature, identified techniques used within the BCC, and developed recommendations for incorporating these practices more consistently. The recommendations cover study design, provider training, treatment delivery, treatment receipt, and enactment of treatment skills.

Three hundred forty-two articles met inclusion criteria; 22% reported strategies to maintain provider skills, 27% reported checking adherence to protocol, 35% reported using a treatment manual, 54% reported using none of these strategies, and 12% reported using all 3 strategies. The mean proportion adherence to treatment fidelity strategies was .55; 15.5% of articles achieved greater than or equal to .80. This tool may be useful for researchers, grant reviewers, and editors planning and evaluating trials.

### Publications ...

Bellg, A., Borrelli, B., Resnick, B., Ogedegbe, G., Hecht, J., Ernst, D., & Czajkowski, S. (2004). Enhancing treatment fidelity in health behavior change studies: Best practices and recommendations from the Behavior Change Consortium. *Health Psychology, 23*(5), 443-451.

Borrelli, B., Sepinwall, D., Ernst, D., Bellg, A. J., Czajkowski, S., Breger, R., DeFrancesco, C., Levesque, C., Sharp, D. S., Ogedegbe, G., Resnick, B., & Orwig, D. (2005). A new tool to assess treatment fidelity and evaluation of treatment fidelity across ten years of health behavior research. *Journal of Consulting and Clinical Psychology, 73*(5), 852-860.

## Additional BCC Publications

- Bellg, A. J., Borrelli, B., Resnick, B., Hecht, J., Minicucci, D. S., Ory, M., Ogedegbe, G., Orwig, D., Ernst, D., & Czajkowski, S. (2004). Enhancing treatment fidelity in health behavior change studies: Best practices and recommendations from the NIH Behavior Change Consortium. *Health Psychology, 23*(5), 443-51.
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# *SPONSORS* and Co-sponsors

## *National Institutes of Health*

NIH is one of the agencies of the Public Health Services which is part of the U.S. Department of Health and Human Services. Comprised of 27 separate components, mainly Institutes and Centers, NIH has in excess of 75 buildings on more than 300 acres in Bethesda, Maryland. The NIH mission is to uncover new knowledge that will lead to better health for everyone. NIH works toward that mission by:

- [•] conducting research in its own laboratories;
- [•] supporting the research of non-Federal scientists in universities, medical schools, hospitals, and research institutions throughout the country and abroad;
- [•] helping in the training of research investigators; and
- [•] fostering communication of medical information.

The goal of NIH research is to acquire new knowledge to help prevent, detect, diagnose, and treat disease and disability, from the rarest genetic disorder to the common cold.

NIH representatives who were active with the BCC included\*:

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Barbara Radziszewska, Ph.D.

\* Some titles and affiliations have changed since the conclusion of the BCC grant period.

## Robert Wood Johnson Foundation

The Robert Wood Johnson Foundation seeks to improve the health and health care of all Americans. To achieve the most impact with our funds, grants are prioritized into four goal areas:

- To assure that all Americans have access to quality health care at reasonable cost. *More than 40 million Americans, nearly 10 million of them children, go without health insurance. This is the single greatest barrier to obtaining timely, appropriate health care services.*
- To improve the quality of care and support for people with chronic health conditions. *One hundred million Americans suffer from chronic health conditions, and that number is almost certain to increase as the population ages.*
- To promote healthy communities and lifestyles. *Our health behaviors, level of social interaction, and other factors outside medical care are important influences on overall health.*
- To reduce the personal, social and economic harm caused by substance abuse — tobacco, alcohol, and illicit drugs. *Tobacco, alcohol, and illicit drugs inflict an enormous toll on Americans, especially among our youth.*

To accomplish these goals, RWJF uses a variety of strategies, including the support of training, education, research (excluding biomedical research), and projects that demonstrate the effective delivery of health care services. Rather than paying for individual care, RWJF concentrates on health care systems and the conditions that promote better health.

## American Heart Association

The following is the current mission statement of the American Heart Association. The mission statement was affirmed by the Delegate Assembly at its meetings of June 1993, June 1996 and June 1999. The mission statement undergoes a formal review process every third year.

- The American Heart Association is a national voluntary health agency whose mission is to reduce disability and death from cardiovascular diseases and stroke.

The American Heart Association (AHA) joined with NIH at the conception of this groundbreaking trans-NIH program. These organizations jointly issued this RFA because the focal behaviors of tobacco use, exercise, diet, and alcohol abuse are behaviors with implications for a wide array of health outcomes for both women and men, including cancer, infectious and allergic diseases, osteoporosis, diabetes, heart disease, arthritis, depression, periodontal diseases, obesity, and kidney diseases, as well as related outcomes such as mood and affect, functional impairment, disability, quality of life, and health care utilization. The behaviors of interest also share a common conceptual basis for change, and each can benefit from findings from research on learning, motivation, risk perception, and the like.

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# Behavior Change Consortium

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