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CONTRACTING ORGANIZATION: University of Wisconsin
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Patricia Clubus 11/6/99

_____ _____

Suzanne Shoff, PhD
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October 29, 1998

Judy Pawlus
Department of the Army
US Army Medical Research and Materiel Command
504 Scott St.
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Dear Ms. Pawlus,

This letter is to inform you that the contents of this annual report (pages 8-13 & 17-24) contain proprietary and unpublished data, and that the distribution statement on page 1 should be changed to limit the distribution of the report.

Thank you for taking note of this.

Sincerely,

Suzanne Shoff

# REPORT DOCUMENTATION PAGE

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**13. ABSTRACT** *(Maximum 200 words)*

This postdoctoral training award supports studies to describe elements of energy balance and breast cancer incidence. The modifying effect of early-life body size and weight change on associations between early-life physical activity and breast cancer risk was evaluated using extant data from a case-control study of breast cancer. Cases (n=6888) were identified through four state-wide cancer registries; controls (n=9529) were randomly selected from population lists. Results suggest that, in premenopausal women, the relation between early-life physical activity and breast cancer risk is similar across all strata of early-life body size and weight change. In postmenopausal women, results suggest that risk reduction associated with physical activity may be greatest in women who were heaviest at age 18, and in women who maintained a stable weight between age 18 and 5 years prior to diagnosis, independent of initial weight. Preliminary data were obtained on intentional weight loss and weight reduction methods from the successful addition of relevant questions to an on-going case-control study of breast cancer. Responses to these questions suggest small, but potentially important, differences between cases and controls regarding patterns of intentional weight loss, choice of weight reduction method, and amount of weight lost.

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N/A In the conduct of research involving hazardous organisms, the investigator(s) adhered to the CDC-NIH Guide for Biosafety in Microbiological and Biomedical Laboratories.

Suzanne Shuff 10/29/98

PI - Signature Date

## INTRODUCTION

This postdoctoral training award supports studies to describe elements of energy balance (energy expenditure as defined by levels of physical activity and energy restriction as defined by weight loss achieved through dieting), factors potentially amenable to intervention efforts, and breast cancer incidence among pre- and postmenopausal women.

### Physical activity

Several studies have reported reductions in breast cancer risk associated with strenuous and/or frequent recreational activity during adolescence or early adulthood, although results across studies are inconsistent (1). Results from our case-control study of women under 75 years of age (2) provides overall support for the observation of a protective effect for regular, moderate to strenuous, activity early in life. We observed a significant 5% reduction in risk for each episode of activity per week; daily vigorous exercise reduced risk by 50%. However, results from a recent prospective study of early-life recreational activity and premenopausal breast cancer, were null (3).

Thune et al. (4) recently reported that the reduced risk of breast cancer associated with activity later in life was limited to women who were lean. Further study is required to determine whether body size modifies the reduction in risk associated with physical activity. For example, it is possible that lean women were active throughout life, including adolescence, or that heavy women became active in an effort to lose weight. Both have different implications for lifetime exposure to endogenous estrogens.

It is possible that the reductions in risk observed in our earlier study may also be modified by early-life body size. To our knowledge, no studies have evaluated how associations between early-life activity and risk of breast cancer may differ according to early-life body size. Therefore, the purpose of the analyses described in this report is to expand our previous analyses of early-life physical activity and risk of breast cancer by evaluating whether reductions in risk were limited to certain groups of women based on their body size at age 18 and subsequent weight change. The modifying effect of body size and weight change was evaluated in pre- and postmenopausal women separately.

### Weight and weight change

The independent effect of body mass on breast cancer risk is not straightforward (5) with the effects of recent body mass varying according to menopausal status (6-11). Weight appears to be inversely related to risk among premenopausal women but is associated with a weak to moderate increase in risk among postmenopausal women. Associations with weight may be due to weight-related differences in hormone function or levels.

Weight loss, by extension, should be associated with a decrease in breast cancer risk, though it is often associated with an increase in morbidity and all-cause mortality (12-15), perhaps due to many studies' inability to distinguish intentional from unintentional weight loss. However, Zeigler (16) found that recent weight loss was associated with a reduced risk of breast cancer

among women of all ages. Our data also suggest that weight loss may be associated with a decrease in risk (17).

Compelling questions regarding intentional weight loss and breast cancer prevention have not been addressed. Limited data from prospective studies are inconsistent with regard to the effects of intentional weight loss. Williamson et al. (18) observed a 20% reduction in all-cause mortality in women with obesity-related disorders who intentionally lost weight. A reduction in cancer mortality among this same group of women was also observed. However, a greater prevalence of disease was reported by women in the Iowa Women's Health Study who reported substantial intentional weight loss in early adulthood (19).

## TECHNICAL OBJECTIVE 1 (PHYSICAL ACTIVITY): METHODS

### Study participants and design

All female residents of Wisconsin, Massachusetts (excluding metropolitan Boston), Maine and New Hampshire, who had a new diagnosis of breast cancer and who were less than 75 years of age, were eligible for this study. Case women were identified by each state's cancer registry from April 1988 through December 1991, except for New Hampshire, where women were enrolled beginning in January 1990. Permission was obtained from each physician of record to interview eligible patients. Eligibility was limited to women with listed telephone numbers, drivers' licenses verified by self-report (if less than 65 years of age), and known dates of diagnosis. Of the 8,532 eligible cases, physicians refused contact for 709 cases (8.3 percent); 464 cases (5.4%) were deceased, 69 (0.8%) could not be located, and 402 (4.7%) refused to participate. Thus, data for 6,888 women were available for analysis, providing an overall response rate for cases of 80.7 percent.

Control subjects were selected from the community using two sampling frames: women under 65 years of age were selected from a list of licensed drivers, and women aged 65-74 years of age were selected from a roster of Medicare beneficiaries compiled by the Health Care Financing Administration. The controls were selected to have an age distribution similar to that of the cases, but with over-sampling of younger control women in the New England states in order to increase the statistical power of the study. Controls had no personal history of breast cancer, a listed telephone number, and, if less than 65 years of age, a driver's license (by self-report). Of the 11,329 eligible controls, 122 (1.1%) had died, 153 (1.4%) could not be located, and 1,521 (13.4%) refused to participate, leaving 9,529 women for analysis. The response rate for controls was 84.2 percent.

### Data collection

Letters were sent to eligible study participants briefly describing the study before contacting them by telephone. A 25-minute telephone interview elicited information on participation in strenuous physical activity or team sports for 2 age periods: ages 14 to less than 18 years, and 18 to 22 years of age. Up to three activities and/or sports were recorded for both time periods, as was the frequency for each reported activity. Information on weight five years prior to interview ("recent weight"), height (defined as tallest adult height), and current height were also obtained. After

August 1988, women were also asked about their weight at age 18. Additionally, the interview covered reproductive history, use of hormones, alcohol consumption, selected dietary items, personal and family medical history, and demographic factors. To maintain blinding, information about the woman's personal and family history of breast cancer was not obtained until the end of the interview; for 78 percent of cases and 90 percent of controls, the interviewers were unaware of the woman's case-control status until the end of the interview.

**Statistical analysis**

Subjects with missing or incomplete information on physical activity (256 cases, 428 controls), menopausal status (260 cases, 378 controls), and weight (recent and at age 18) or height (219 cases, 312 controls) were excluded from analyses. Analyses were therefore limited to the remaining 6186 cases (1572 pre- and 4614 postmenopausal) and 8452 controls (2635 pre- and 5817 postmenopausal).

Each physical activity reported was classified by average rate of energy expenditure and assigned a score, defined as the ratio of work metabolic rate to resting metabolic rate (MET score) (20). Adjusting for frequency of activity during the queried time period, an average intensity score was calculated as the mean of the MET scores for the various reported activities. In addition to intensity of physical activity, frequency of activity (times/year) was also examined separately. For analyses reported herein, physical activity (intensity and frequency) represent the averaged activity from the time periods 14-18 years of age and 18-22 years.

The reference age for cases was defined as their age at diagnosis. A comparable reference age for controls was defined which was equal to the age at interview minus the average time from diagnosis to interview for the case group within each state (range, 8-21 months). Quartiles for recent body mass index (BMI) (recent weight (kg) / tallest height ($m^2$)) and BMI at age 18 (weight at age 18 (kg) / tallest height ($m^2$)) were calculated based on the separate distributions of premenopausal and postmenopausal control subjects. Women were classified as postmenopausal if they reported natural menopause or bilateral oophorectomy before their reference date. Women who reported hysterectomy alone and at least one remaining ovary were classified as premenopausal if their reference age was in the first decile of age at natural menopause among the controls (< 42 years for smokers and < 43 years nonsmokers), and as postmenopausal if their age at surgery was in the highest decile for age at natural menopause in the control group (> 54 years for smokers and > 55 years for nonsmokers). Women's menopausal status was considered unknown if they had undergone hysterectomy without bilateral oophorectomy at an intermediate age (second to ninth decile).

Odds ratios and 95 percent confidence intervals from multivariable logistic regression models were used to evaluate relative risks. Conditional models stratified according to age (to intervals of approximately 0.10 years) and state were used to accommodate the different age distribution of the controls in each state (21). Effect modification was evaluated by examining the difference in the log-likelihood between models with and without an interaction term. For menopausal status, interaction terms were the products of the dichotomous menopausal status variable and

continuous physical activity variables. For effect modification by BMI , the interaction terms were the products of continuous BMI variables and continuous physical activity variables. Models were stratified by menopausal status and quartile of BMI (recent and at age 18), and adjusted for parity, age at first birth, age at menarche, family history of breast cancer, education, and for postmenopausal women, age at menopause. Models evaluating recent BMI also included weight at age 18 as a covariate. These potential confounders were considered a priori to be established risk factors for breast cancer and were therefore included in all models regardless of statistical significance. Women with missing values for covariates were assigned to unknown categories and retained in all analyses.

## TECHNICAL OBJECTIVE 1 (PHYSICAL ACTIVITY): RESULTS

Table 1 shows odds ratios and 95% confidence intervals for the main effects of physical activity, BMI at age 18 years, and weight change (between 18 years of age and 5 years prior to diagnosis) in pre- and postmenopausal subjects. Frequent (daily) early-life physical activity was associated with a 45-50% reduction in risk for both pre- and postmenopausal breast cancer, although this association was statistically significant in postmenopausal subjects only. Reductions in risk were observed with intensity of activity in postmenopausal subjects; the magnitude of the reduction was smaller than for frequency. BMI at 18 years of age was inversely associated with premenopausal breast cancer; a slight inverse trend was also observed in postmenopausal women. Weight change was not associated with breast cancer in premenopausal subjects but was directly associated with postmenopausal breast cancer risk.

Figures 1 and 2 graphically display associations between frequency of physical activity and risk of premenopausal breast cancer stratified by level of BMI and weight change, respectively. The patterns of association between activity and risk of breast cancer were similar across all strata of BMI (p-interaction = 0.72, Figure 1). The interaction between physical activity and weight change was also not statistically significant (p = 0.37). However, the data suggest that premenopausal women in the first quartile of weight change had a greater reduction in breast cancer risk with increasing frequency of activity (Figure 2).

Figure 3 shows the relation between physical activity and risk of postmenopausal breast cancer according to BMI at age 18 years (p-interaction = 0.02). Frequency of activity was not associated with risk in the lightest women (first quartile of BMI). Reductions in risk were observed in heavier women, particularly those in the fourth quartile of BMI.

Associations between physical activity and postmenopausal breast cancer risk within weight change strata are shown in Figure 4 (p-interaction = 0.03). Frequency of activity was inversely associated with breast cancer risk in women who lost weight (p-trend = 0.005). For all other weight change strata, the association with physical activity was predominantly null.

## TECHNICAL OBJECTIVE 1 (PHYSICAL ACTIVITY): DISCUSSION

Results from these analyses suggest that, in premenopausal women, the relation between early-life physical activity and breast cancer risk is similar across all strata of early-life body size and weight change. In postmenopausal women, results suggest that risk reduction associated with physical activity may be greatest in women who were heaviest at age 18, and in women who, on average, maintained a stable weight between age 18 and 5 years prior to diagnosis, independent of initial weight.

The implications of these findings are that early-life physical activity appears to be beneficial in all women, particularly heavier ones, consistent with the hypothesis regarding the importance of early life events affecting the development of breast cancer late in life. However, the greatest benefit of early-life activity may be in women who maintain stable weights. This is an important finding in light of recent evidence indicating an increasing prevalence of overweight and obese adults in the United States (22).

## TECHNICAL OBJECTIVES 2 & 3 (INTENTIONAL WEIGHT LOSS): METHODS

### Study participants and design

This population-based case-control study is currently in the data collection phase. All female residents of Wisconsin, Massachusetts (excluding metropolitan Boston), and New Hampshire, who were reported to their state's cancer reporting system as of July 1996 and who are less than 70 years of age, are eligible for this study. Permission is obtained from each physician of record to interview eligible patients. Eligibility is limited to women with listed telephone numbers, drivers' licenses verified by self-report (if less than 65 years of age), and known dates of diagnosis. As of October 1998, 2906 eligible cases have been identified; 2336 have been interviewed. Overall case response rate to date is 80%.

Control subjects are selected from the community using two sampling frames: women under 65 years of age are selected from a list of licensed drivers, and women aged 65-69 years of age are selected from a roster of Medicare beneficiaries compiled by the Health Care Financing Administration. Controls are selected to have an age distribution similar to that of the cases. Eligible controls have no personal history of breast cancer, a listed telephone number, and, if less than 65 years of age, a driver's license (by self-report). Of the eligible controls identified as of October 1998, 3168 have been interviewed (overall response rate = 77%).

### Data collection

Letters are sent to eligible study participants introducing the study before contacting them by telephone. The 40-minute telephone interview obtains detailed information on lifetime recreational physical activity and occupation history. Additionally, the interview covers reproductive history, use of hormones, selected dietary items, personal and family medical history, and demographic factors. To maintain blinding, information about the woman's personal and family history of breast cancer is not obtained until the end of the interview.
Questions to ascertain intentional weight loss, and the means by which weight loss was achieved,

were successfully added to the parent study. The questions added to the telephone interview are:

- Did you ever lose at least 10 pounds on purpose?
- If yes, Did you lose at least 10 pounds or more on purpose during [year prior to diagnosis]?
- If yes, How many times did you lose 10 pounds or more?
- How much did you lose, on purpose, the [first, second, third, fourth] time?
- [for each weight loss episode]: And what methods did you use [up to two, from list]
- [list of weight loss methods: low calorie diet, low fat diet, skipped meals, over-the-counter diet pills, commercial weight loss program, prescription medication, exercise, laxatives or water pills, gastric surgery, regurgitation]

**Statistical analysis**

Interview data as of April 1998 were uploaded to an analytic file. Frequency of responses to each question were obtained for 1058 cases and 1628 controls. No statistical tests have been performed.

## TECHNICAL OBJECTIVES 2 & 3 (INTENTIONAL WEIGHT LOSS): RESULTS

- The distributions of responses to the weight loss questions are presented in Tables 2-4. Fifty-eight percent of case subjects and 55% controls reported losing at least 10 pounds during their lifetime. Those reporting ever losing 10 pounds were heavier, on average, than those reporting never losing 10 pounds. Cases reporting intentional weight loss were slightly heavier than controls reporting weight loss (Table 2).

During the year prior to diagnosis, a similar percentage of cases (13%) and controls (12%) reported an intentional weight loss of at least 10 pounds. Cases subjects reporting only one intentional weight loss episode were heavier than controls reporting one weight loss episode. Cases reporting two or three episodes of weight loss were lighter than controls (Table 3). Cases and controls reported similar amounts of weight loss.

Table 3 shows distributions of weight loss method. The four most common methods were low calorie diet, commercial weight loss program, exercise and low fat diet. Distributions were generally similar between cases and controls. Among case women using a low calorie diet for weight loss, 29% also reported exercise. A greater percent of controls (31%) reported exercise in addition to using a low calorie diet (data not shown).

Among the four most common weight loss methods, use of a low fat diet resulted in the greatest weight reduction for cases (21 pounds); commercial weight loss programs resulted in the greatest amount of weight loss for controls (23 pounds).

## TECHNICAL OBJECTIVES 2 & 3 (INTENTIONAL WEIGHT LOSS): DISCUSSION

Preliminary data suggest small, but potentially important, differences between cases and controls regarding patterns of intentional weight loss, choice of weight reduction method, and amount of weight lost. We anticipate that these data, once complete, will provide unique information on intentional weight loss, weight loss method, and risk of pre- and postmenopausal breast cancer.

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## OTHER ACTIVITIES

The postdoctoral trainee has participated in numerous activities to enhance and broaden her training in cancer prevention. These activities include:

**Meetings**

1. Active participation in weekly staff meetings.
2. Regular participation in monthly meetings between the cancer registry personnel, state epidemiologists, and breast cancer study personnel.
3. Periodic consultation with grant consultants.

**Manuscripts**

Recently published:

Shoff SM, Newcomb PA. Diabetes, body weight and risk of endometrial cancer. *Am J Epidemiol* 1998; 148: 234-240.

Shoff SM, Newcomb PA, Mares-Perlman JA, Klein BEK, Klein R. Consumption of phytoestrogen containing foods and sex hormone levels in postmenopausal women. *Nutr Cancer* 1998; 30: 207-212.

In preparation:

Shoff SM, Newcomb PA, Remington PL, Trentham-Dietz, Longnecker MP, Greenberg ER, Willett WC. Early life physical activity and risk of breast cancer: modifying effects of body size and weight change. In preparation for *Cancer Epidemiol Biomark Prev.*

Shoff SM, Newcomb PA. Physical activity and risk of endometrial cancer. In preparation for *Cancer Causes Control.*

**Professional conferences**

American Association for Cancer Research, 89th Annual Meeting, New Orleans LA, March 1998.
Society for Epidemiologic Research, 31st Annual Meeting, Chicago IL, June 1998.

**Lecture, presentations**

1. Guest lecturer in Chronic Disease Epidemiology, Preventive Medicine 801, Fall 1998. "Epidemiology of Colorectal Cancer".
2. Speaker in the UW Department of Nutritional Sciences seminar series, Fall 1998. "Body Size Modulates Cancer Risk Factors".
3. Presenter at annual meeting of Collaborative Breast Cancer Study, Sarasota FL, May 1998. "Patterns of Usual Weight, Intentional Weight Loss, and Weight Reduction Method in Control Subjects: Preliminary Data".

**Grant writing**

1. As part of the UW Comprehensive Cancer Center's core grant renewal, Cancer Control section, wrote "Post-Diagnosis Factors and the Survival of Women with Breast Cancer: Establishing a Cohort".
2. Extensive participation in a recent intramural pilot grant submission to the UW Comprehensive Cancer Center: "A Social Marketing/Diet Study to Prevent Cancer".

**Campus-wide seminars**

1. Regularly attends seminars in the following departments: Preventive Medicine, Comprehensive Cancer Center (grand rounds), Nutritional Sciences, Sociology.
2. Regular participant in monthly Nutritional Epidemiology journal club meetings.

**PLANS FOR YEAR 2**

**Meetings**

1. Continued participation in weekly staff meetings.
2. Continued participation in monthly meetings between the cancer registry personnel, state epidemiologists, and breast cancer study personnel.
3. Continued periodic consultation with grant consultants.

**Projects/Manuscripts**

1. Recent and lifetime participation in physical activity and postmenopausal breast cancer: modifying effects of body size.
2. Reliability and validity studies of intentional weight loss in pre- and postmenopausal women.
3. Determinants of physical activity in older women.
4. Weight, weight change and colorectal cancer survival.
5. Diet and breast cancer in Vietnamese women.

**Professional conferences**

Federation of American Societies for Experimental Biology, Washington DC, April 1999.
Society for Epidemiologic Research, 32nd Annual Meeting, Baltimore MD, June 1999.

**Lecture, presentations**

1. Guest lecturer in Chronic Disease Epidemiology, Preventive Medicine 801, Fall 1999.
2. Guest lecturer in Nutritional Epidemiology, Nutritional Sciences 875, Fall 1999.

**Grant writing**

1. Continued participation in the preparation of an R01 to NCI on a social marketing/diet intervention study to increase fruit/vegetable consumption in a minority community.

**Campus-wide seminars**

1. Continued attendance at various departmental seminars.
2. Continued participation in Nutritional Epidemiology journal club meetings.

## APPENDICES

## Appendix 1: Table of main effects (Technical Objective 1).

Table 1. Odds ratios (OR) and 95% confidence intervals (CI) of breast cancer according to level of early life physical activity, body mass index and weight change.*

| | Premenopausal | | | Postmenopausal | | |
|---|---|---|---|---|---|---|
| | cases (n=1572) | controls (n=2635) | OR (95% CI) | cases (n=4614) | controls (n=5817) | OR (95% CI) |
| *Physical Activity*: | | | | | | |
| Frequency (times per year) | | | | | | |
| 0 | 925 | 1466 | 1 | 2969 | 3600 | 1 |
| 1 - 47 | 328 | 586 | 0.92 (0.77-1.09) | 825 | 1085 | 0.94 (0.85-1.05) |
| 48 - 103 | 177 | 309 | 0.96 (0.77-1.19) | 368 | 497 | 0.93 (0.80-1.08) |
| 104 - 363 | 132 | 243 | 0.89 (0.70-1.14) | 397 | 531 | 0.90 (0.78-1.04) |
| > 363 | 10 | 31 | 0.50 (0.23-1.07) P-trend = 0.03 | 55 | 104 | 0.55 (0.39-0.78) P-trend = 0.004 |
| Intensity (weighted MET score) | | | | | | |
| 0 | 925 | 1468 | 1 | 2970 | 3604 | 1 |
| 1-2 | 195 | 332 | 0.89 (0.72-1.09) | 560 | 692 | 0.95 (0.84-1.08) |
| 3-4 | 273 | 503 | 0.93 (0.78-1.12) | 694 | 957 | 0.91 (0.81-1.02) |
| 5-12 | 179 | 332 | 0.91 (0.73-1.14) P-trend = 0.20 | 390 | 564 | 0.86 (0.74-1.00) P-trend = 0.02 |
| BMI at 18 years of age (quartile)** | | | | | | |
| 1 | 389 | 638 | 1 | 1191 | 1451 | 1 |
| 2 | 438 | 649 | 1.05 (0.87-1.26) | 1173 | 1456 | 0.97 (0.97-1.09) |
| 3 | 419 | 682 | 0.97 (0.80-1.17) | 1094 | 1437 | 0.89 (0.79-1.00) |
| 4 | 326 | 666 | 0.76 (0.63-0.93) P-trend = 0.001 | 1156 | 1473 | 0.92 (0.82-1.03) P-trend = 0.002 |

Table 1, continued.

| | Premenopausal | | | Postmenopausal | | |
|---|---|---|---|---|---|---|
| | cases (n=1572) | controls (n=2635) | OR (95% CI) | cases (n=4614) | controls (n=5817) | OR (95% CI) |
| Weight Change Quartile (age 18 to recent)*** | | | | | | |
| 1 | 316 | 614 | 1.03 (0.84-1.27) | 855 | 1311 | 0.89 (0.79-1.00) |
| 2 | 373 | 665 | 1 | 1096 | 1503 | 1 |
| 3 | 461 | 722 | 1.04 (0.86-1.25) | 1234 | 1529 | 1.11 (0.99-1.24) |
| 4 | 422 | 634 | 1.02 (0.84-1.23) P-trend = 0.89 | 1429 | 1474 | 1.32 (1.18-1.48) P-trend = 0.001 |

* Physical activity estimates adjusted for BMI at age 18, age at first full-term pregnancy, parity, age at menarche, family history of breast cancer, education, and, in postmenopausal subjects, age at menopause. BMI estimates adjusted for frequency of physical activity and other covariates listed above. Weight change estimates adjusted for frequency of physical activity, height, weight at age 18 and other covariates listed above.

**Quartile ranges ($kg/m^2$) for BMI at age 18 are: Premenopausal, quartile 1=12.5-18.9, 2=19.0-20.4, 3=20.5-22.3, 4=22.4-47.6. Postmenopausal, quartile 1=11.0-18.6, 2=18.7-20.1, 3=20.2-21.8, 4=21.9-85.7.

***Quartile ranges (kg) for weight change are: Premenopausal, quartile 1=-51.7-1.4, 2=1.5-5.4, 3=5.5-11.3, 4=11.4-171.5 Postmenopausal, quartile 1=-149.7-4.1, 2=4.2-10.0, 3=10.1-17.7, 4=17.8-93.0.

**Appendix 2: Figures of breast cancer risk according to frequency of activity, body size and weight change in pre- and postmenopausal women (Technical Objective 1).**

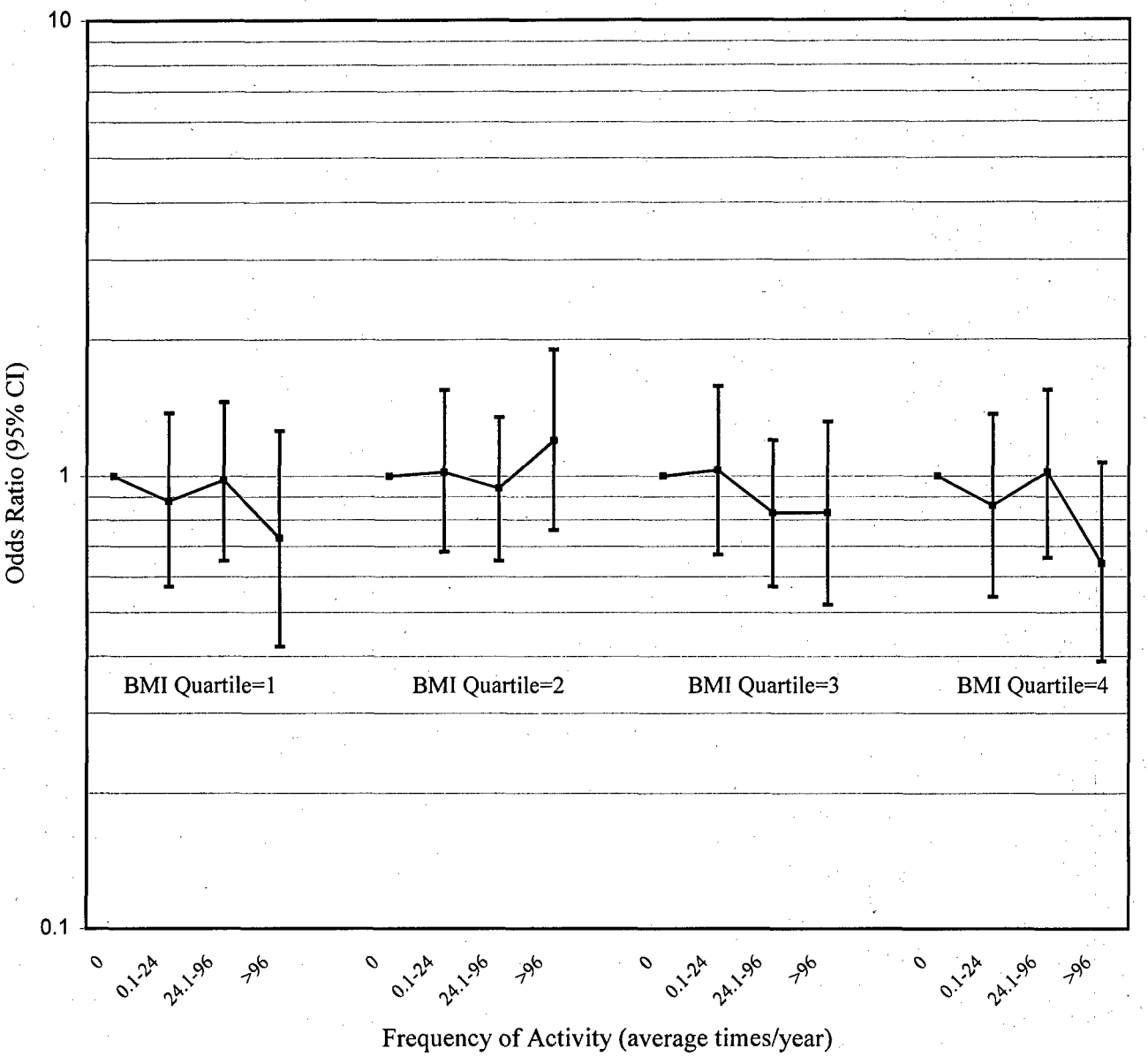


Figure 1. Risk of premenopausal breast cancer according to frequency of early-life physical activity and body mass index ($kg/m^2$) at age 18.

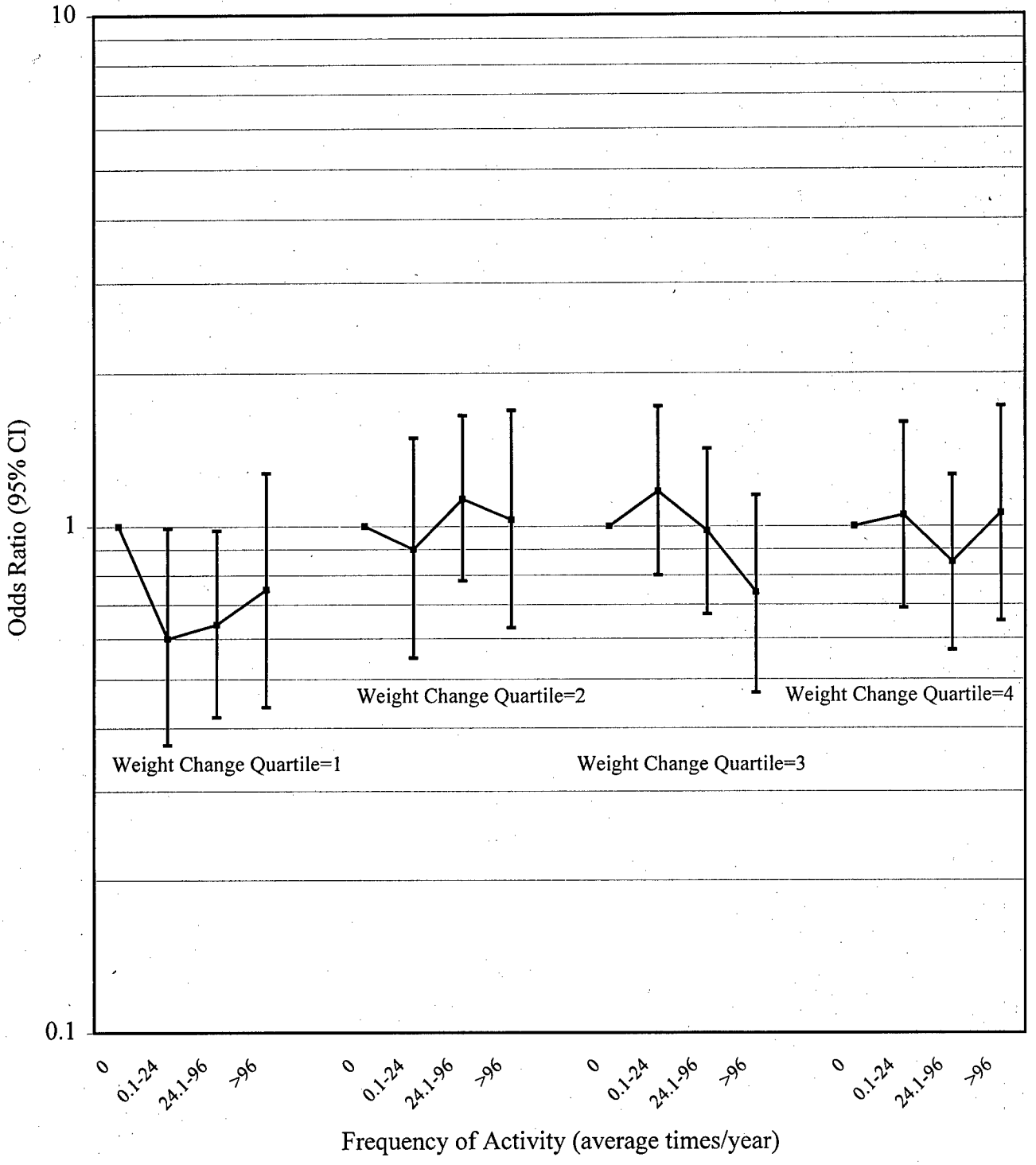


Figure 2. Risk of premenopausal breast cancer according to frequency of early-life physical activity and weight change (kg).

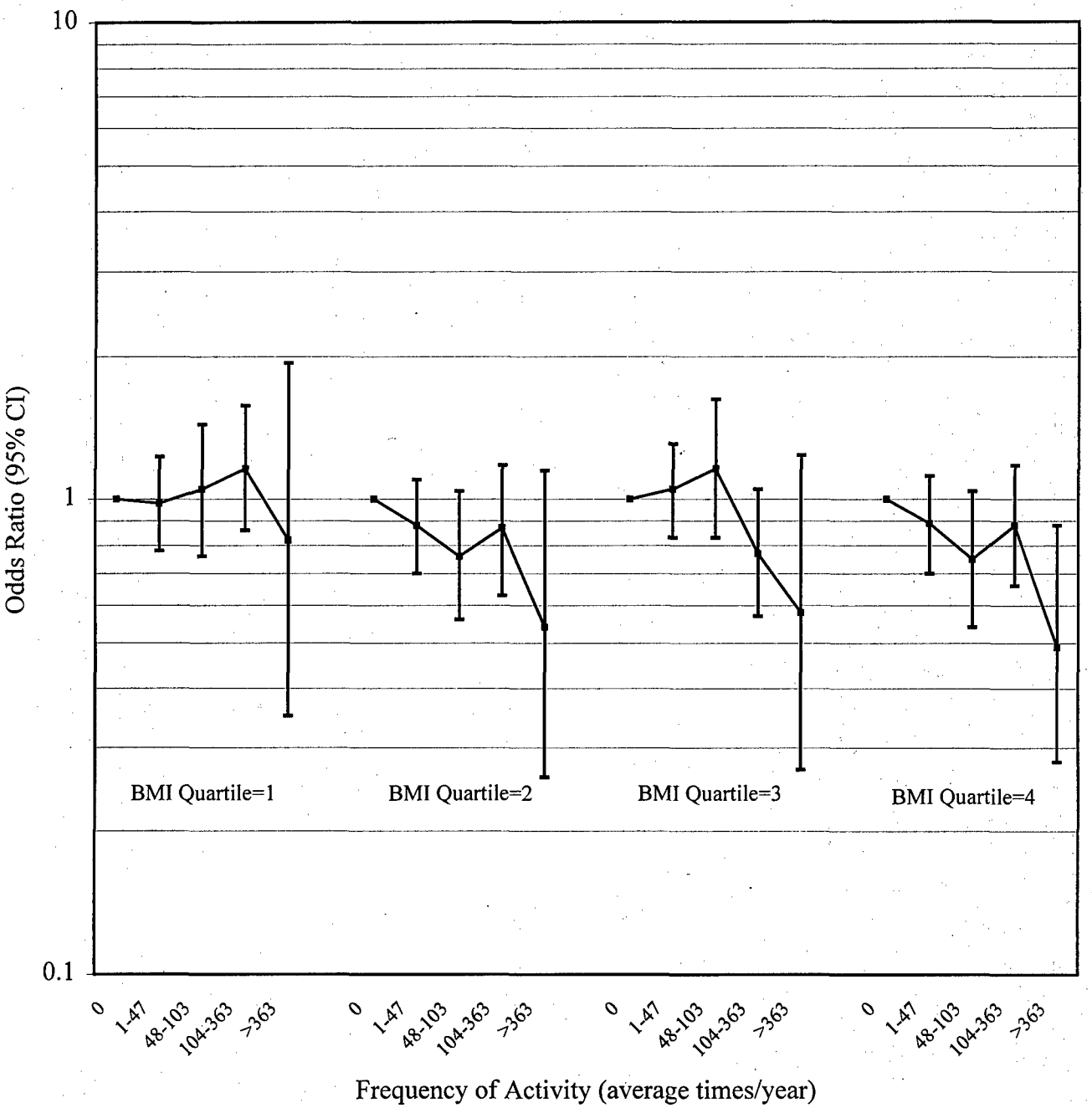


Figure 3. Risk of postmenopausal breast cancer according to frequency of early-life physical activity and body mass index ($kg/m^2$) at age 18.

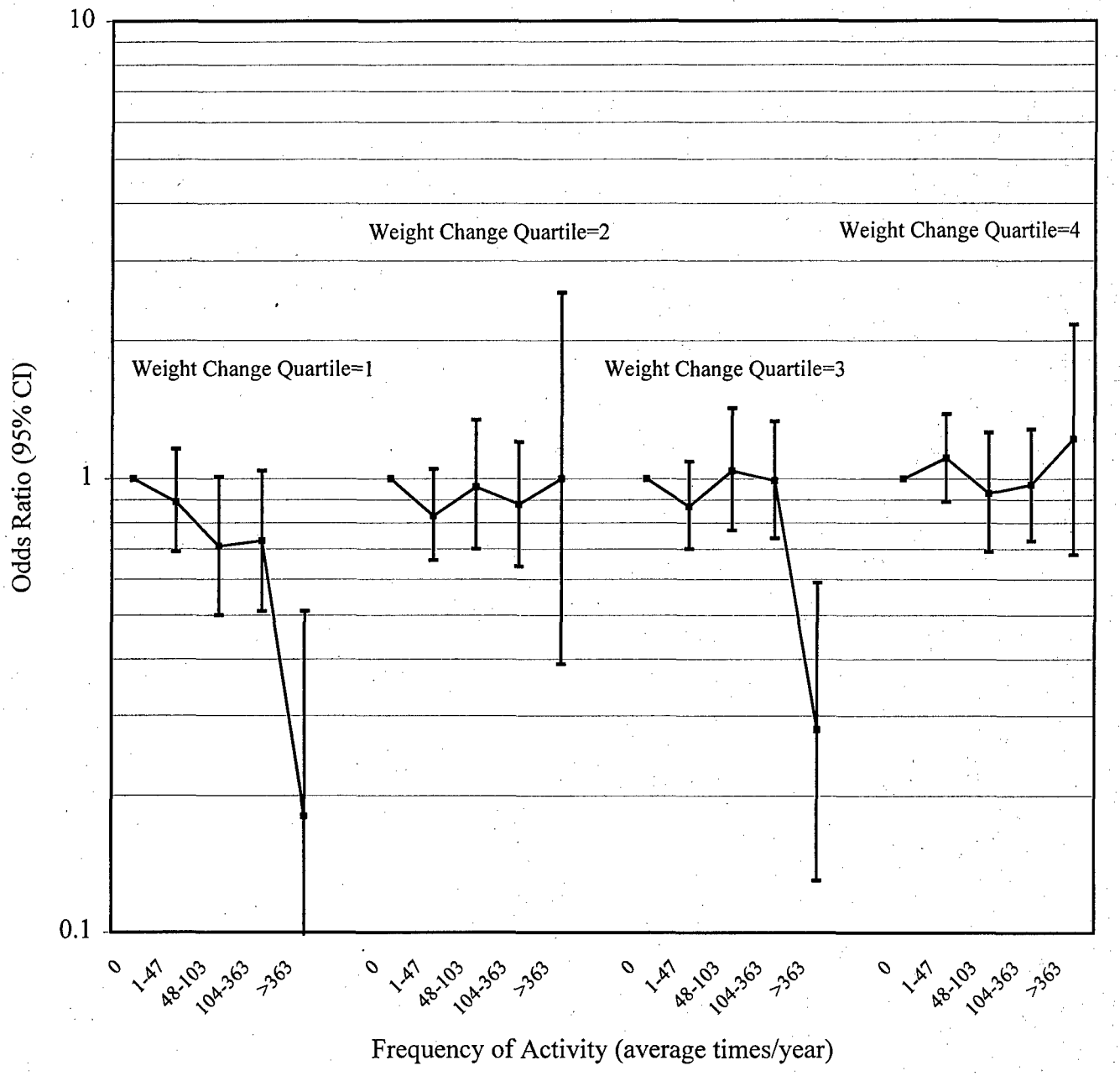


Figure 4. Risk of postmenopausal breast cancer according to frequency of early-life physical activity and weight change (kg).

**Appendix 3: Tables of responses to weight loss questions (Technical Objectives 2 & 3).**

Table 2. Responses to question: Did you ever lose 10 pounds or more on purpose?

| | Cases (n=1058) | | Controls (n=1628) | |
|---|---|---|---|---|
| | % (n) | usual weight (pounds)* | % (n) | usual weight (pounds)* |
| No | 42 (446) | 141 | 45 (727) | 141 |
| Yes | 58 (612) | 166 | 55 (901) | 163 |

* Average of usual weight during the year prior to diagnosis.

Table 3. Responses to question: Did you lose 10 pounds or more during the year prior to diagnosis?

| | Cases (n=549) | | | Controls (n=834) | | |
|---|---|---|---|---|---|---|
| | % | usual weight during year prior to diagnosis | pounds lost | % | usual weight during year prior to diagnosis | pounds lost |
| No | 87 | 164 | | 88 | 161 | |
| One time | 12 | 176 | 1st time: 19 | 11 | 169 | 1st time: 19 |
| Two times | 0.6 | 150 | 2nd time: 10 | 0.6 | 163 | 2nd time: 10 |
| Three times | 0.2 | 126 | | 0.2 | 138 | |

Table 4. Frequency (%) of weight loss methods for first episode of weight loss during year prior to diagnosis.

| | Cases (n=72) | | Controls (n=103) | |
|---|---|---|---|---|
| | first method | second method | first method | second method |
| low calorie diet | 39 | 10 | 41 | 10 |
| low fat diet | 13 | 8 | 11 | 10 |
| skipped meals | 3 | 1 | 3 | 0 |
| diet pills (over-the-counter) | 0 | 0 | 2 | 0 |
| commercial weight loss program | 26 | 0 | 28 | 0 |
| prescription medications | 3 | 1 | 2 | 1 |
| exercise | 14 | 15 | 13 | 18 |
| only one method | | 63 | | 60 |

Table 5. Pounds lost according to weight loss method for first episode of weight loss during year prior to diagnosis.

| | Cases | Controls |
|---|---|---|
| low calorie diet | 19 | 16 |
| low fat diet | 21 | 18 |
| skipped meals | 15 | 33 |
| diet pills (over-the-counter) | -- | 10 |
| commercial weight loss program | 19 | 23 |
| prescription medications | 25 | 33 |
| exercise | 18 | 17 |

**DEPARTMENT OF THE ARMY**
US ARMY MEDICAL RESEARCH AND MATERIEL COMMAND
504 SCOTT STREET
FORT DETRICK, MARYLAND 21702-5012

Recd 8/16/2001

REPLY TO
ATTENTION OF:

MCMR-RMI-S (70-1y) 9 August 2001

MEMORANDUM FOR Administrator, Defense Technical Information Center (DTIC-OCA), 8725 John J. Kingman Road, Fort Belvoir, VA 22060-6218

SUBJECT: Request Change in Distribution Statement

1. The U.S. Army Medical Research and Materiel Command has reexamined the need for the limitation assigned to technical reports. Request the limited distribution statement for reports on the enclosed list be changed to "Approved for public release; distribution unlimited." These reports should be released to the National Technical Information Service.

2. Point of contact for this request is Ms. Judy Pawlus at DSN 343-7322 or by e-mail at judy.pawlus@det.amedd.army.mil.

FOR THE COMMANDER:

PHYLIS M. RINEHART
Deputy Chief of Staff for
Information Management

Encl