Gender Differences in Quality-Adjusted Survival Using a Health-Utilities Index

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Purpose: Women live longer than men but experience high morbidity during later years. We attempt to represent life expectancy with adjustments for quality of life for men and women in the United States.

Data Sources: Survival estimates were obtained from Vital Statistics of the United States Life Tables. Quality-of-life data were obtained for 12,220 participants, aged 32–85 years, in the 1982–1984 National Health and Nutrition Examination Survey I Epidemiologic Follow-Up Study (NHEFS).

Method: Using public data tapes, scores for the Health-Utilities Index (HUI) were imputed for NHEFS. These scores were calculated separately for men and women in the United States population and broken down by age. Using mortality data, the quality-adjusted life expectancy was calculated separately for men and women.

Results: The current life expectancy among men aged 32 years was 39.45 years. For women aged 32 years it was 44.83 years, suggesting a 5.38 female life-expectancy advantage. The life expectancy, adjusted for quality of life, was 31.8 years for men versus 33.1 years for women. Adjustment for quality of life reduced the 5.38-year female advantage to 1.3 years.

Conclusions: Although women enjoy longer life expectancies than do men, this advantage is reduced when quality adjustments are used. The finding reflects high levels of morbidity among older women.

Medical Subject Headings (MeSH): quality of life, gender, health surveys, health status indicators, life expectancy, life tables (Am J Prev Med 2000;18(1):77–82)

Introduction

Women in the United States live an average of 5.38 years longer than men.[1] However, studies on health-related quality of life consistently show that women experience greater morbidity than men.[2] Men are more likely to die suddenly of heart disease or accidents, while women are more likely to live longer but experience longer periods of disability.[2–5] The literature on morbidity and mortality among women has been reviewed in several places,[6,7] and concerns about morbidity in older women led to the development and funding of the Women's Health Initiative (WHI), a series of overlapping clinical trials and observational studies involving more than 164,000 women.[8] The literature can be confusing because there are several reports showing that women experience significant morbidity in late life.[2,5,9] However, several recent studies suggest that health-related quality of life may be better for older women in comparison with older men when matched for diagnosis of coronary artery disease[10] or heart failure.[11] Other studies have suggested that emotional vitality[12] and daytime activity[13] may be higher in older women than in older men. However, most of these studies used convenience rather than population samples. The measures of quality of life varied from study to study and none of the reports offers combined indexes of morbidity and mortality. This is a concern because subjects in these studies are the survivors from their birth cohorts.

If women experience lesser mortality but greater morbidity, it is not clear how to provide population-based estimates of health status. If measures of mortality are chosen, women have better health status. On the other hand, using measures of morbidity, men have better health status in some studies, and women have better health status in other studies. We have proposed measures of survival that make adjustments for quality of life.[14–17] In order to represent total health status, new methods of analysis, known as Quality-Adjusted Survival Analysis, are required.

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Mortality or survival analysis codes all those living as 1.0 while those who are dead are coded as 0.0. The difficulty is that everyone who remains alive is given the same score. A person confined to bed with an irreversible coma is scored the same as someone who is healthy. Both are given 1.0 for being alive.

Because the analysis treats all living persons similarly, traditional survival analysis has problems evaluating outcomes when both morbidity and mortality are important. On the other hand, there are also biases associated with the exclusive focus on morbidity or quality of life because death is ignored. Death is clearly an important health outcome.

Several years ago Kaplan and colleagues[18] reported a study estimating Quality-Adjusted Survival Analysis for men and women in Southern California. This study demonstrated that the 7-year life-expectancy advantage for women is reduced to about 3 years when adjustments for quality of life are made. In other words, the quality adjustment had significantly more impact on women than on men. Analysis suggested that overall health status was better for men until about age 45 and better for women after age 45.

The previous study had several significant limitations. Although the mortality data came from the U.S. population, the morbidity data came from a very small sample of people in the San Diego area. The total sample size for the estimation of quality of life was only 867. As a result, the number of individuals in any particular age group was small and potentially unreliable. A second problem was that the analysis was geographically confined to Southern California. It seems unreasonable to estimate U.S. values on the basis of a selected region. A third limitation was that a single measure of health-related quality of life was used. This measure, known as the Quality of Well-Being (QWB) Scale,[19] is used in a wide variety of studies. However, the QWB has not been used for population studies, and it is not known whether QWB results generalize to other population-based measures.

The study reported in this paper uses data from the 1982–1984 United States National Health and Nutrition Examination Survey Epidemiologic Follow-Up Study (NHEFS). This study is based on a much larger sample size, including more than 10,000 adults who were alive at the time of follow-up. Since the study is based on a representative sample of the United States population, generalizations are not restricted to Southern California. Further, this study reports outcomes using an analogue of the Health-Utilities Index (HUI) developed by Torrance and Associates.[20,21] The HUI is a similar method of providing quality-adjusted survival estimates to that used in the previous study. The QWB and the HUI measures provide slightly different numbers. The QWB has been used as a basis for policy in the United States, while the HUI has been used in Canada. The HUI may also be used to set objectives for the year 2010 and has received greater use in population studies and policy analysis. Variation in the methods will help support the generalizability of the results.

We predicted that measures of morbidity and mortality would offer different impressions of the health status of men and women. Although it is known that women live longer than men, we predicted an interaction between gender and age for a combined index of morbidity and mortality.

Methods

In order to calculate quality-adjusted survival, we used several data sources.

Survival

Survival estimates for men and women in the United States were obtained from the 1990 Vital Statistics of the United States (1990) Life Tables.[22] These data are based on the entire U.S. population and use an age interval of 1 year. Survival estimates described the portion of each birth cohort surviving to particular ages.

National Health and Nutrition Examination Survey (NHANES)

The National Health and Nutrition Examination Survey I (NHANES I) was based on a national probability sample of approximately 28,000 people from the civilian noninstitutionalized population of the United States. Only persons living on reservations for Native Americans were excluded from the sample frame. The survey began in 1971 and was completed in 1975. In order to assure representation of those at high risk for malnutrition, persons of low income, women of childbearing age, and the elderly were oversampled. Weighting procedures were used to adjust the observations so that they would be representative of the U.S. population. Participants of NHANES I were between the ages of 1 and 74 years. The NHANES I sample included 20,729 people 25–74 years of age of whom 14,407 (70%) were medically examined.

The analysis reported in this paper used the NHANES I Epidemiologic Follow-Up Survey (NHEFS), which was conducted between 1982 and 1984. The follow-up study population included the 14,407 participants who were medically examined in NHANES I; 12,220 had data that could be used to estimate the HUI. The analysis file includes 4942 males (mean age 66.46 years, SD = 20.36 years) and 7278 females (mean age 59.99 years, SD = 18.47 years). Racial composition of the sample was white (85.1%), African American (13.9%), Asian (0.7%), and Native American (0.2%).

Analysis suggests that subjects who were lost to follow-up were more likely to have died than those who

were successfully traced. A strong association between smoking and loss to follow-up indicates that the effects of smoking on mortality, especially at younger ages, should be interpreted with caution. Among those aged 55 years and over, the proportion lost to follow-up is quite small relative to the proportion deceased. Thus, in these age groups, there should be relatively little bias as a result of loss to follow-up.

Health-Utilities Index Mark I

The HUI Mark I[20,21] was used to estimate quality of life. These estimates were used to quality adjust the survival data. The HUI Mark I assesses four major concepts of health-related quality of life: physical function, which includes mobility and physical activity; role function, which includes self-care and role activity; social-emotional function, which includes well-being and social activity; and health problems. The concepts and levels of function within the concepts comprise a health-status classification scheme. Individuals are categorized into one and only one level within each concept according to their functional status at the time the data were collected. The HUI is scored using a complex multiattribute weighting system. The specific weights are given in the study by Feeny and colleagues.[23]

The reliability and validity of the HUI has been summarized by Feeny et al.[23] One study demonstrated the reliability of the HUI in the Canadian general social survey. The test–retest reliability was estimated to be 0.77. Perfect reliability is not expected since health status is presumed to change over time. The validity evidence comes from several population studies including the National Health and Nutrition Examination Survey in which the HUI was shown to predict future health states.[24] Clinical studies have shown a variety of differences between diagnostic groups. For example, children with extremely low birth weight had lower HUI scores than control children when both groups were measured at age 8 years.[25]

The development of an HUI Mark I analog using data collected in NHEFS, the NHEFS-HUI, builds on a similar project that was done using data from the National Health Interview Survey. This project developed a six-step model for conducting retrospective analyses that was used to guide the construction of the health-related quality-of-life measure that is used in this analysis to adjust survival data.[14,15] Following the steps in this model has been shown to result in a reliable and valid summary of population health status. In this study, we apply the imputation method to derive HUI scores from data collected in a national survey.

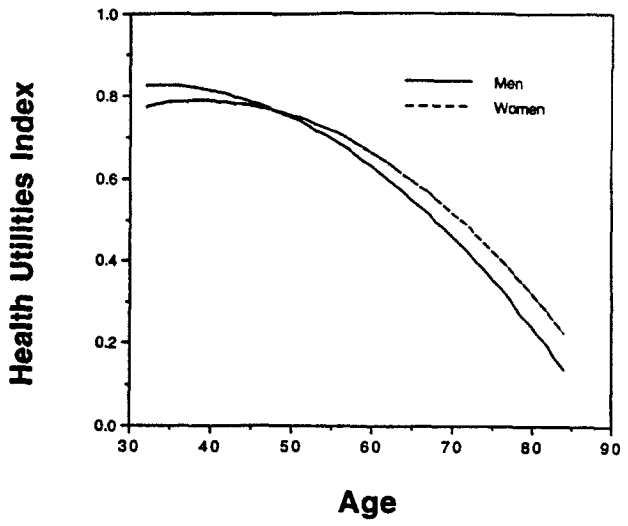

Figure 1. Smoothed and fitted polynomial curves for men and women. Dashed lines show 95% confidence intervals.

Results

In order to estimate Quality-Adjusted Life Expectancy, several calculations were required. First, we estimated life expectancy using the United States Life Tables.[22] These tables show current life expectancies using 1-year intervals. Next, the NHEFS data were broken down by age. The NHANES Epidemiologic Follow-Up Survey includes values for individuals between the ages of 32 and 85. Quality-adjusted survival is the product of the NHEFS-HUI value at each age and the proportion of the population surviving to that age interval. The mean value for the index for young individuals is near 0.85, while those later in the life span have values closer to 0.20. These differences reflect the impact of both death and quality of life.

In order to obtain smooth functions for both men and women, we fit simple polynomials to these curves. For men, the polynomial equation was:

$$\text{estimated NHEFS-HUI} = 0.55007 + 0.0169 \times \text{age} - 0.000259 \times \text{age}^2$$

For women the equation was:

$$\text{estimated NHEFS-HUI} = 0.37293 + 0.02126 \times \text{age} - 0.0002737 \times \text{age}^2$$

The fitted lines are shown graphically in Figure 1. As the figure demonstrates, men score higher on the mortality-adjusted HUI early in life. However, at about age 48, the curves intersect. Thereafter, the quality-adjusted survival is higher for women than it is for men. To evaluate these functions statistically, multiple regression analysis was used to estimate HUI as a function of age, gender, and the interaction of age and gender. These analyses were done twice, once using the combined index of morbidity and mortality and once using the morbidity only or live-person index.

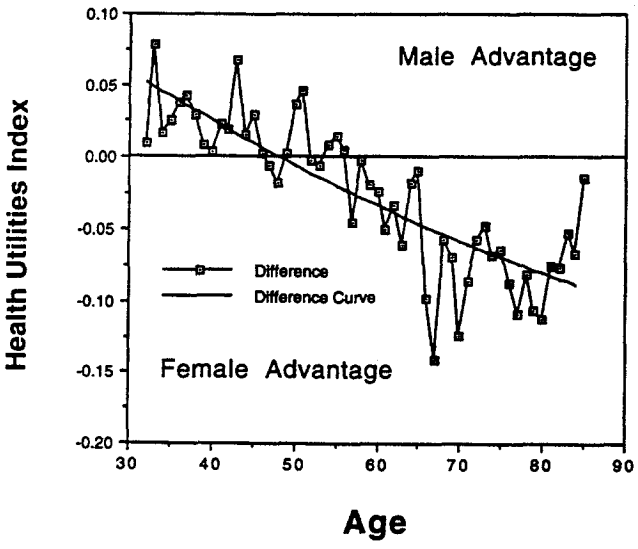

Figure 2. Male minus female differences by age using raw data and fitted curve.

For subjects still alive in 1984 (N = 10,267), the multiple R was 0.33 ($F_{3/10,263} = 411.99$, $p < 0.0001$). The coefficient for age was statistically significant ($t = -6.33$, $p < 0.001$), as was the interaction between age and gender ($t = -3.29$, $p < 0.001$). However, the effect of gender was nonsignificant ($t = -0.33$, $p =$ NS). Using an HUI that included death as 0.0, the regression was highly significant (R = 0.70, $F_{3/11960} =$ 3,764.91, $p < 0.0001$). Coefficients for age ($t = -44.82$), gender ($t = -14.84$), and the interaction of age and gender ($t = 13.25$) were all statistically significant ($p < 0.0001$). The significant product term for age and gender indicates that men have significantly higher mortality-adjusted quality of life early in the life cycle, while women have higher quality-adjusted survival later in the life cycle (Fig. 1). Overall, men had significantly higher HUI scores than women for the index that includes death ($p < 0.001$).

Figure 2 is another summary of the differences between men and women at different stages of the life cycle. The jagged line shows the raw difference of the means. This line was created by subtracting the mortality-adjusted NHEFS-HUI scores for women from the scores for men at each age. The smooth line on the figure was created by subtracting the differences between the fitted curves at each age. The figure shows the health advantage of being male until about age 48, with a female advantage thereafter. Further, the health advantage of being female becomes progressively stronger with advancing age.

Using data from the United States Vital Statistics, we estimated the number of life-years remaining for men and women in the NHEFS population. The total life expectancy at birth could not be estimated because the NHEFS database did not have information on individuals younger than age 32. The current life expectancy among 32-year-olds was 39.45 for men and 44.83 years for women. Thus, for 32-year-olds, women have a 5.38 life-expectancy advantage. Using NHEFS-HUI scores as quality adjustments, the quality-adjusted life expectancy was 31.8 years for men and 33.1 years for women. In other words, the 5.38-year life-expectancy advantage for women reduces to a 1.3-year advantage with adjustments for quality of life.

Table 1 presents comparisons between males and females on the HUI for all subjects (including those who have died) and for all those living in 1984. The table also presents scores for the HUI subscales. The data are shown separately for all subjects, those younger than age 40 and those older than 60. For those 40 years of age or younger, inclusion of death in the HUI score has no effect because there were no deaths in this age group. However, for those older than 60 years, the index that includes death shows women scoring higher than men, while the index excluding death reveals the opposite pattern. For the HUI subscales, men generally obtained higher scores than women, except for the physical subscale (all subjects). Because of the large sample size, t-tests for all comparisons in Table 1 are statistically significant ($p < 0.01$) except for the comparison between men and women over age 60 on the physical subscale.

Table 1. Means and standard deviations for HUI indexes and four components for all men and women and for subgroups aged 40 years or less and aged 60 years or more

	All		<40		>60	
Variable	Men N = 4942	Women N = 7278	Men N = 585	Women N = 1147	Men N = 2883	Women N = 3219
HUI Living	0.788 (0.220)	0.740 (0.239)	0.872 (0.167)	0.821 (0.180)	0.729 (0.237)	0.655 (0.272)
HUI All	0.622 (0.376)	0.669 (0.314)	0.872 (0.167)	0.821 (0.180)	0.461 (0.399)	0.510 (0.362)
Physical	0.936 (0.094)	0.943 (0.092)	0.993 (0.035)	0.982 (0.039)	0.898 (0.039)	0.897 (0.109)
Problems	0.947 (0.054)	0.939 (0.053)	0.964 (0.046)	0.952 (0.047)	0.943 (0.056)	0.933 (0.056)
Role	0.962 (0.091)	0.947 (0.105)	0.986 (0.057)	0.979 (0.061)	0.952 (0.100)	0.924 (0.127)
Social	0.969 (0.063)	0.953 (0.074)	0.960 (0.070)	0.946 (0.079)	0.976 (0.056)	0.961 (0.069)

HUI, Health-Utilities Index.

Discussion

Using data from the NHANES and standard life tables, we evaluated differences between the health status for men and women in the United States. These estimates suggest that, on average, women live longer than men. However, during the years toward the end of life, women experience a lower quality of life than do men. Although women have a live-expectancy advantage, adjustments for quality of life reduced the advantage significantly.

This study closely replicates an earlier investigation.[18] However, the earlier study was flawed for several reasons. First, the data in the previous study were from a single community in California. Further, the earlier study had a small sample and used data from a single quality-of-life measure. This study uses a larger sample size and a sample that is representative of the U.S. population. Further, a completely different quality-of-life index was used. Nevertheless, the results are strikingly similar. The similarity of these findings confirms their robustness.

Similar findings have also been reported for the Canadian population.[26] Thus, despite the limitations, we have reason to believe the results are consistent with other research. Together, these studies indicate that when measured independently, both morbidity and mortality are incomplete measures. As suggested over three decades ago, we need combined index numbers to summarize population health.[27]

There are many different explanations for the finding that women have lower mortality but more morbidity in later life. In order to evaluate the results, we must first consider the issue of mortality differences. Population statistics show that men are more likely than women to die at all ages throughout the life span. Mortality ratios can be formed by dividing male by female deaths, standardized per 100,000 persons in the population. Even at age 1 year, the ratio is 1.26, suggesting that there are 1.26 1-year-old male deaths for each 1-year-old female death. The peak ratio is during adolescence and early adulthood. Between the ages of 15 and 24, there are 3.1 male deaths for each female death. Thereafter, the ratio falls off as a function of age. Yet, even in the 85-and-older category, 1.27 males die for each female who dies. It is interesting that our analysis shows that there was a male advantage early in the life span, precisely when the male-female mortality ratio is the highest. The reason men have a higher mortality-adjusted NHEFS-HUI score is that men experience higher quality of life during the first four decades of life. Further, the total number of deaths during these decades is very small.

Another explanation for the differences is that men and women are affected by different diseases. Men are more likely to be victims of diseases or problems that cause death early in life. There are differential rates of death from several causes. Men, for example, are 3.9 times more likely to be victimized by homicide than are women. There are seven causes of death for which men are at least twice as likely to die as women. These are homicide, lung cancer, suicide, chronic obstructive pulmonary disease, accidents, cirrhosis of the liver, and heart disease. Each of these is believed to be related to individual behavior. For example, lung cancer and chronic obstructive pulmonary disease are both caused primarily by smoking cigarettes. Homicide, accidents, and cirrhosis of the liver each are associated with alcohol use.[28] Suicide is a behavioral act, and the relationship between behavior and heart disease has been discussed extensively.[29] These data suggest that men are more likely to put themselves at risk for early and sudden death, while women live longer to be affected by slow and disabling chronic diseases. Women, for example, are more likely to experience nonfatal but prevalent autoimmune diseases and osteoporosis.

There are several important limitations to this study. First, the NHEFS does not have quality-of-life data for individuals <32 years. Thus, differences during the first three decades of life are excluded from the analysis. A second concern is that quality-of-life scores for the mortality-adjusted HUI Mark I were imputed rather than directly measured. The imputation introduces some imprecision in the estimates. Further, the only data set available for these analyses was completed in 1984. Although the observations are clearly dated, we suspect that they would be similar to more current data. Confirmation of this in future studies is necessary.

In summary, quantifying health outcome for men and women can be difficult. Summary measures that emphasize mortality show a strong advantage to being female, while measures of quality of life suggest some advantages to being male. Combined indexes of morbidity show a male advantage prior to midlife and a female advantage thereafter. The life-expectancy advantage for women is somewhat reduced when there are adjustments for quality of life. Comprehensive summaries of population health must combine morbidity and mortality into a common index.[27] Independently, morbidity and mortality each give an incomplete picture of population health.

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References

1. Births and Deaths, United States, 1996. Monthly Vital Statistics Report 1996;46:S2.
2. Wingard DL. The sex differential in morbidity, mortality, and lifestyle. Ann Rev Pub Health. 1984;5:433–58.
3. Verbrugge LM. The twain meet: empirical explanations of sex differences in health and mortality. J Health Soc Behav 1989;30:282–304.

4. Verbrugge LM, Wingard DL. Sex differentials in health and mortality. Women and Health. 1987;12:103–45.
5. Wingard DL, Cohn BA. Variations in disease-specific sex morbidity and mortality ratios in the United States. In: Ory MG, Warner HR, eds. Gender, health, and longevity: Multidisciplinary perspectives. New York, NY: Springer Publishing Co.;1990:25–37.
6. Kaplan RM, Alcaraz JE, Anderson JP, Weisman M. Quality-adjusted life years lost to arthritis: effects of gender, race, and social class. Arthritis Care Research 1996;9:473–82.
7. Verbrugge LM. Women, men, and osteoarthritis. Arthritis Care Research 1995;8:212–20.
8. Matthews KA, Shumaker SA, Bowen DJ, et al. Women's health initiative. Why now? What is it? What's new? Am Psychologist 1997;52:101–16.
9. Verbrugge LM, Patrick DL. Seven chronic conditions: their impact on US adults' activity levels and use of medical services. Am J Public Health 1995;85:173–82.
10. Lukkarinen H, Hentinen M. Assessment of quality of life with the Nottingham Health Profile among women with coronary artery disease. Heart Lung 1998;27:189–99.
11. Murberg TA, Bru E, Aarsland T, Svebak S. Functional status and depression among men and women with congestive heart failure. Intl J Psychiatry Med 1998;28:273–91.
12. Penninx BW, Guralnik JM, Simonsick EM, Kasper JD, Ferrucci L, Fried LP. Emotional vitality among disabled older women: the Women's Health and Aging Study. J Am Geriatr Soc 1998;46:807–15.
13. Sakakibara S, Kohsaka M, Kobayashi R, Honma H, Fukuda N, Koyama T. Gender differences in self-evaluated sleep quality and activity of middle-aged and aged subjects. Psychiatry Clin Neurosci 1998;52:184–6.
14. Erickson P, Anderson JP, Kendall EA, Kaplan RM, Ganiats TG. Using retrospective data for measuring quality of life: National health interview survey data and the quality of well-being scale. Qual Life and Cardiovas Care 1988; 4:179–84.
15. Erickson P, Kendall EA, Anderson JP, Kaplan RM. Using composite health status measures to asses the nation's health. Med Care 1989;27(suppl 3):S66–76.
16. Erickson P, Kendall EA, Odle MP, Torrance GW. Assessing health-related quality of life in the National Health and Nutrition Examination Survey. Working Paper. National Center for Health Statistics: Hyattsville, MD, 1992.
17. Kaplan RM, Anderson JP. The general health policy model: An integrated approach. In: Spilker B, ed. Quality of Life and Pharmacoeconomics in Clinical Trials. New York, NY: Raven Press; 1996:309–22.
18. Kaplan RM, Anderson JP, Wingard DL. Gender differences in health-related quality of life. Health Psychol 1991;10:86–93.
19. Kaplan RM. Quality of life assessment for cost/utility studies in cancer. Cancer Treat Rev 1993;19(suppl A):85–96.
20. Torrance GW, Feeny D. Utilities and quality-adjusted life years. Internat J Technol Assess Health Care 1989;5:559–75.
21. Torrance GW. Utility approach to measuring health-related quality of life. J Chronic Dis 1987;40:593–603.
22. Vital Statistics of the US Life Tables, Volume 2, Section 6, United States Department of Health and Human Services (DHHS Pub No PHS 88-1104), 1985. Washington, DC: US Government Printing Office, 1985.
23. Feeny DH, Torrance GW, Furlong WJ. Health Utilities Index. In: Spilker ND, ed. Quality of life and pharmacoeconomics in clinical trials, 2d ed. Philadelphia, PA: Lippincott-Raven, 1996: 239–52.
24. Franks P, Gold M, Erickson P. Do utility-based measures of health-related quality of life predict future health states? longitudinal evidence from a nationally representative cohort presented at the Society of Medical Decision Making, Portland, OR, 1992.
25. Saegal S, Rosenbaum P, Stoskoph B, et al. Comprehensive assessment of the health status of extremely low birth weight children at eight years of age: comparison with a reference group. J Pediatrics 1994;125:411–7.
26. Reynolds DL, Torrance GW, Badley EM, et al. Modeling the population health impact of musculoskeletal diseases: Arthritis. J Rheumatology 1993;20:1037–47.
27. Sullivan DF. Conceptual Problems in Developing an Index of Health. DHEW Pub No HRA 76-1017, Series 2, No 17. Rockville, MD: US Dept of Health, Education, and Welfare, 1996
28. Single E, Robson L, Rehm J, Xi X. Morbidity and mortality attributable to alcohol, tobacco, and illicit drug use in Canada. Am J Public Health 1999;89:385–90.
29. Labarthe DR. Epidemiology and Prevention of Cardiovascular Diseases: a Global Challenge. Gaithersburg, MD: Aspen Publishers, 1998.

Brief Report

The Quantity and Quality of Physical Activity Among Those Trying to Lose Weight

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Background: Regular exercise to elicit caloric expenditure is an important component for achieving weight loss. The *Healthy People 2000* objectives recommend regular sustained physical activity lasting 30 minutes, five days per week (Objective 1.3) particularly for weight loss. Moreover, this recommendation has been restated for weight loss and overall health benefits in the Centers for Disease Control and Prevention / American College of Sports Medicine (CDC/ACSM) statement and Surgeon General's Report (SGR) on Physical Activity and Health. Thus, we sought to identify the relative quality and quantity of physical activity among people trying to lose weight.

Design: Cross-sectional self-reported data from the West Virginia Behavioral Risk Factor Surveillance System (BRFSS) were used. The BRFSS is a state-based telephone survey of adults that uses a multistage cluster design based on the Waksberg method of random-digit dialing. Data from 2769 men and 4490 women were obtained from the 1992, 1994, and 1996 surveys.

Results: Half (49.6%) of individuals trying to lose weight did not engage in any physical activity. Further, only 15% of respondents trying to lose weight reported exercising regularly. Nevertheless, those trying to lose weight were more likely (OR [odds ratio] = 1.3; 95% CI [confidence interval], 1.14, 1.51, $p < 0.001$) to exercise regularly than those not trying to lose weight. In particular, women trying to lose weight were significantly more likely (OR = 1.45; 95% CI, 1.22,1.74, $p < 0.001$) to exercise regularly than women not trying to lose weight. Conversely, men trying to lose weight were no more likely to exercise regularly ($p = .23$) than men not trying to lose weight. Among respondents who were using exercise for weight loss, only 14.7% were expending ≥1000 kcal/week and 18.2% were expending ≥500 kcal/week. Weekly expenditure rates of ≥1000 kcal/week were more likely to occur among men (17%) than women (13.8%), in younger age groups, and among those with higher educational attainment.

Conclusion: These data suggest that while certain individuals trying to lose weight are more likely to engage in regular physical activity, most persons trying to lose weight have not adopted regular physical activity as part of their weight loss practice. These results suggest that public health efforts to effectively integrate physical activity into weight control practices of West Virginians have been minimally successful.

Medical Subject Headings (MeSH): physical fitness, exercise, weight loss, guidelines, public health, leisure activity (Am J Prev Med 2000;18(1):83–86)

Introduction

More Americans are overweight now than ever before[1] and with the addition of obesity as a primary risk factor for cardiovascular disease,[2] the public health community has made strong appeals for overweight people to pursue weight loss. Regular exercise to elicit caloric expenditure is considered an important component for achieving weight loss and for long-term weight control.[3] The *Healthy People 2000* objectives recommend regular sustained activity lasting 30 minutes, five days per week (Objective 1.3), particularly for weight loss.[4] Furthermore, this recommendation has been restated for overall health benefits. Currently, a minimum of 150 kcal per day or 1000 kcal per week of physical activity has been recommended.[3] Given these recommendations and the rising prevalence of overweight people in the United States, we sought to identify the weight-loss practices (Table 1), and specifically identify the quality and quantity of physical activity, among people trying to lose weight.

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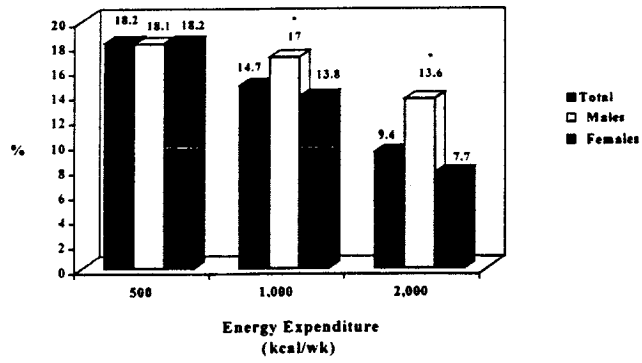

Figure 1. Prevalence of individuals who are using physical activity for weight loss and meeting minimal weekly expenditure rates of 500, 1000, and 2000 Kcal. $*p < 0.05$; males vs females.

Methods

Cross-sectional self-reported data from the 1992, 1994, and 1996 West Virginia Behavioral Risk Factor Surveillance System (BRFSS) were used.[5] Since exercise intensity, duration, and frequency are all encompassed by the total volume of activity, we chose to report the weekly caloric expenditure rates, given that this is most important for weight loss. Leisure-time energy expenditure estimates were generated using an algorithm that included caloric expenditure estimates derived from the compendium of physical activities.[6]

Results/Discussion

These data suggest that although certain individuals trying to lose weight are more likely to engage in regular physical activity, most have not adopted regular physical activity as part of their weight-loss practice. Only 15.8% of respondents trying to lose weight reported exercising regularly. Even though there was no difference observed between genders, women trying to lose weight were more likely to achieve a regular sustained exercise pattern than women not trying to lose weight. This was not the case for men, where the likelihood of engaging in regular exercise was no different, whether trying to lose weight or not. Perhaps of even greater intrigue is that only 14.7% of those using physical activity as a strategy for weight-loss purposes were achieving the recommended minimum weekly caloric expenditure rates for health, providing evidence that the moderate physical activity message has apparently not penetrated the public's awareness.

Given that physical activity, in combination with dieting, has been recognized as an integral weight-loss strategy for several years, one might expect people attempting to lose weight to be more willing to embrace a strategy that included regular moderate exercise. After all, the rate of weight loss is positively related, in a dose-response manner, to the frequency and duration of physical activity.[3] Yet in the present study, only 16% of BRFSS respondents who were trying to achieve weight loss were participating in 30 minutes of moderately intense activity five or more days per week. Furthermore, no differences in the frequency of activity were observed between individuals using physical activity for weight loss and those not trying to lose weight. An increase in the volume of activity has been particularly recommended for weight-loss purposes.[3,4] The Surgeon General's Report (SGR) recommends that people expend approximately 1000 kcal per week for health benefits.[3] Consequently, even individuals who exercise vigorously three times per week may not accrue a sufficient caloric expenditure to have an impact on weight loss. In the present study, only a little more than one eighth of respondents who reported using physical activity as a strategy for weight loss are meeting the SGR recommendation. Even worse, 18% of respondents who were using physical activity for weight loss were achieving ≥500 kcal per week (Figure 1). This suggests that more than 80% of individuals who are using physical activity as a strategy for weight loss are expending too little energy to significantly contribute to improved health let alone weight loss. These data suggest that public health efforts to communicate the physical activity and weight control message have been minimally accepted and adopted by the public.

It is important to consider that the BRFSS collects cross-sectional, self-reported data and, thus, there is no direct evidence that activities reported were performed for the purpose of losing weight. In addition to physical

Table 1. Overweight status and weight-loss practices

	Trying to lose weight (%)	BMI ≥ 25.0 kg/m² (%)	Weight loss practices (%)		
			Dieting alone	Diet and exercise	Exercise alone
Total	35	54.7	45.6	48	1.6
Men	27	23.7	46.3	48	2
Women	39.9	31	44	47	2.8
BMI ≥ 25.0 kg/m²	48.4	—	45.8	48.4	2
Men	35.17	—	44.8	47	2.9
Women	31.4	—	46.2	48.9	1.6

BMI, body mass index.

Table 2. Percentage of individuals with weekly caloric expenditure rates ≥ 1000 kcal by weight control status from the 1992, 1994, and 1996 Behavioral Risk Factor Survey

Characteristics	Sample size	≥1000 Kcal/wk: Trying to lose weight (%)	≥1000 Kcal/wk: Not trying to lose weight (%)	Odds ratio	(95% CI)
Total	7,258	8.9	6.1	1.49*	1.24, 1.8
Males†	2,769	10.7	7.7	1.43*	1.07, 1.92
Females	4,489	8.1	4.9	1.7*	1.3, 2.19
Age					
18–24	671	15.4	14.5	1.07	.66, 1.73
25–34	1,243	10.2	9.5	1.08	.73, 1.61
35–44	1,525	10.4	6.7	1.62*	1.1, 2.3
45–54	1,162	8.2	4.9	1.71*	1.03, 2.84
55–64	937	5.2	4.2	1.2	.63. 2.38
65+	1,703	5.7	2.3	2.62*	1.46, 4.7
Education					
<12 yrs	2,691	5.9	3	2.0*	1.33, 3.0
12 yrs	1,962	7.5	4.9	1.57*	1.06, 2.34
Some college (13–15 yrs)	1,065	10.8	7.7	1.45	.93, 2.26
College (16 + yrs)	1,130	13.9	12.4	1.14	.78, 1.66
Income					
<$10,000.00	217	4.8	4.5	1.06	.24,, 4.4
+10,000–19,999	564	4.1	3.5	1.15	.43, 3.04
$20,000–34,999	724	8.3	6.1	1.4	.76, 2.6
$35,000–49,999	309	16.7	6.7	2.8*	1.25, 6.3
>$50,000	305	19.3	12.9	1.6	.83, 3.12
BMI ≥ 25 kg/m^2	6,538	8.7	5.9	1.5*	1.24, 1.81

*$p < 0.05$, between trying to lose weight vs not trying to lose weight; † males who were trying to lose weight were 1.36 (95% CI ± 0.47) times more likely to be expending ≥1000 kcal per week than women who were trying to lose weight; BMI, body mass index; CI, confidence interval

activity questions, a separate section of the BRFSS asks participants whether they are trying to lose weight and what their strategies for weight loss are, which may include the use of physical activity and/or caloric restriction and reduced fat intake. However, it is important to understand that the section of the BRFSS on weight loss is asked following the physical activity questions, which appears to minimize any bias of physical activity reporting by the desire for weight loss.

Efforts to increase awareness using a variety of community channels are needed throughout various demographic groups. The sociodemographic differences among persons using physical activity for weight loss observed in the present investigation are comparable to other findings. We observed that women, those with a lower socioeconomic status, and older individuals were less likely to attain the 1000 kcal per week recommendation (Table 2). Nevertheless, so few people are attaining the current recommendations for physical activity that direct and accurate messages to communities at all levels and to a wide array of individuals are needed. Creating physical and social environments that are more conducive to exercise may help to reduce barriers that may prohibit individuals from achieving these recommendations.[7] Moreover, policies that allow for more physical activity to be incorporated throughout the day may also help. One policy that may increase public awareness is the use of preventive counseling by primary care providers. Studies have shown this to be an effective means for improving health behaviors.[8] In light of this finding, however, a recent investigation has found a current lack of preventive counseling by primary care providers in the United States.[9] Physicians reported offering counseling for physical activity during only 19.1% of office visits. Furthermore, preventive counseling was lowest in the South, where cardiovascular disease rates are among the highest.

Conclusion

In addition to increasing awareness of the physical activity and health message, physical activity specialists need to consider the current lack of specificity of the message. The recommended dosage of physical activity needs to be specific to a particular health outcome, such as weight loss. Haskell[10] has suggested that differ-

ent doses of activity are necessary to modify various risk factors. As such, several narrow physical activity messages that are tailored to improve specific health outcomes may be more easily communicated and provide more meaning to the public. We propose that a specific weight control message be developed for the public. Within this statement, two distinct objectives should be addressed. First, a clear and tailored message should identify a specific volume of activity necessary for weight loss and weight maintenance purposes. Second, individuals trying to lose or maintain weight need to be better instructed on how to eliminate the consumption of energy-dense convenience foods and how to monitor the portion sizes of food.

References

1. Flegal KM, Carroll MD, Kucsmarski RJ, Johnson CL. Overweight and obesity in the United States: prevalence and trends, 1960–1994. Int J Obesity 1998;18:39–47.
2. Eckel RH, Kraus RM. American Heart Association call to action: obesity as a major risk factor for coronary heart disease. Circulation 1998;97:2099–100.
3. US Health and Human Services. Physical activity and health: a report of the Surgeon General. Atlanta, GA: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, 1996.
4. US Health and Human Services. Healthy People 2000: National Health Promotion and Disease Prevention Objectives—full report, with commentary. Washington, DC: US Health and Human Services, Public Health Service, 1991. DHHS Pub No PHS 91-50212.
5. Powell-Griner E, Anderson JE, Murphy W. State and sex-specific prevalence of selected characteristics—Behavioral Risk Factor Surveillance System 1994 and 1995. MMWR Morb Mortal Wkly Rep 1997;46(SS03):1–29.
6. Ainsworth BE, Haskell W, Leon A, et al. Compendium of physical activities: classification of energy costs of human physical activities. Med Sci Sports Exerc 1993;25:71–80.
7. King AC, Jeffery RW, Fridinger F, et al. Environmental and policy approaches to cardiovascular disease prevention through physical activity: issues and opportunities. Health Educ Q 1995;22:499–511.
8. Calfas KJ, Long BJ, Sallis JF, Wooten W, Pratt M, Patrick K. A controlled trial of physician counseling to promote the adoption of physical activity. Prev Med 1996;25:1–9.
9. Centers for Disease Control and Prevention. Missed opportunities in preventive counseling for cardiovascular disease—United States, 1995. MMWR Morb Mortal Wkly Rep 1998;47(5):91–5.
10. Haskell WL. Dose-response issues from a biological perspective. In: Bouchard C, Shephard R, Stephens T, eds. Physical activity, fitness and health: international proceedings and consensus statements. Champaign, IL: Human Kinetics, 1994:1030–9.