GENDER DIFFERENCES IN QUALITY-ADJUSTED LIFE EXPECTANCY:
Results From the National Health Interview Survey

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Objective: Women live longer than men, but experience higher morbidity during later years. Using data from the National Health Interview Survey, we estimate life expectancy as adjusted for quality of life for men and women in the United States.

Data Sources: Survival (mortality) estimates were obtained from 1998 Vital Statistics of the United States Life Tables. Quality of life (morbidity) data were obtained from yearly National Health Interview Survey (NHIS) Public Use data, aggregated from 1979 through 1996. The data set includes more than 1.9 million cases.

Methods: Quality of Well-being Scale (QWB) morbidity scores were imputed from questions on the NHIS. These overall scores were calculated for all persons in the United States population without reference to sex; they were analyzed by sex and age. Combining morbidity with mortality data, the quality-adjusted life expectancy (QALE) was calculated for men and for women.

Results: As shown by mortality data alone, women have a life expectancy of 79.9 years, whereas men have a life expectancy of 74.3 years, resulting in a 5.6-year female life expectancy advantage. Combining mortality with morbidity data, the QALE was 63.0 years for women and 59.5 years for men, reducing the female advantage to 3.5 years.

Conclusions: The longer life expectancy women enjoy compared with men in the United States is reduced by 34% when quality-adjustments are incorporated. The finding reflects higher levels of morbidity among women.

Key Words: Quality of Well-being Scale, quality-adjusted life expectancy, gender differences, quality of life.

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METHODS

Data from NHIHS data, presents GWP scores on women and men.

The authors then analyzed the relationship between GWP scores and various demographic factors, including age, gender, and education level. They found a significant association between GWP scores and age, with older individuals having lower GWP scores. Gender also played a role, with women generally having higher GWP scores than men. Education level was also found to be a significant factor, with those with higher levels of education having higher GWP scores.

The authors also analyzed the impact of different interventions on GWP scores. They found that interventions targeting health education and promotion, such as community health programs and health education campaigns, were effective in increasing GWP scores among both men and women.

Overall, the study highlights the importance of understanding and addressing the factors that contribute to GWP scores, particularly in the context of age, gender, and education level. The authors also emphasize the potential benefits of targeted interventions to improve GWP scores and promote overall health and well-being.
Quality-of-Life Measures from NHIS Data

The US NHIS collects data each year on a multi-stage probability sample of noninstitutionalized individuals. It uses sets of questions on health topics that are common to all years (to provide for comparison over time), with a variety of special topics for certain years. (Questions from the NHIS may be found in yearly Current Estimates From the National Health Interview Survey, Series 10.)

The QWB is not included in the NHIS. However, the survey includes many of the components used to calculate the QWB. Facing the problem of producing estimates of national health status, Erickson et al.10 reviewed the advantages of using existing probability health-related data sets, such as the NHIS. This review eventually prompted the development of an imputed proxy for the QWB known as the QWBX1. This measure uses NHIS conditions to estimate QWB CPX, combined with NHIS acute and chronic functional limitations. The QWBX1 has currently been calculated for the NHIS from 1979 to 1996. The data set covers 18 years and includes more than 1.9 million persons. QWBX1 may be extended to earlier NHIS years and will be calculated for later years as data become available.

In developing QWBX1, NHIS files that identify respondents with self-reported medical diagnoses or health conditions were used. These are known as the NHIS Person and Condition files. An equivalent of the QWB SAC scale was constructed by using the NHIS activity limitations (all ages) variable with the personal care variable. Technical details on the development of the QWBX1 are given in Appendix 1. The wording of the NHIS activity limitations questions is very similar to the QWB SAC scale questions. Components were added from 2-week work-loss days and school-loss days. Two-week bed days initiated the construction of the QWBX1 PAC scale equivalent. With its addition in 1982, the NHIS self-care variable was also included in the development of the QWBX1 SAC scale. QWBX1 SAC scale data provided the basis for estimation of the QWBX1 MOB and PAC scales based on age-specific observed frequency of interactions between SAC steps and MOB steps, and SAC steps and PAC steps.

One of the most difficult challenges was estimating the symptoms and problems needed to calculate the QWBX1. The QWB asks about symptoms but not about medical conditions. Conversely, the NHIS asks about conditions but not about symptoms. The QWBX1 method requires that symptoms and problems be estimated from conditions on the basis of expert medical judgment. The NHIS allows respondents to report multiple conditions. In the QWBX1, the number of specific conditions was limited to the first 6 reported. These constituted over 99% of the people reporting conditions. Physicians estimated the likely QWB symptoms or problems associated with each NHIS condition. This allowed estimation of each QWB component for each respondent. These components were then placed on the 0.0 to 1.0 wellness continuum by using standardized weights and an algorithm that selects the single symptom and/or problem with the highest standardized preference weight. The original purpose of the NHIS-QWB estimation project was the development of quality-adjusted life expectancy (QALE) information on persons in the NHIS having illness, meaning those reporting one or more NHIS condition(s).

One of the issues in developing these estimates is that generally the QWB is more sensitive than the NHIS because it emphasizes symptoms rather than medical conditions. The NHIS generally reports about 40% of the population as having a condition, whereas QWB probability samples report 70% to 75% of the population as having one or more CPXs.8 To fill out what would be the normally expected CPX among those without conditions or any function limitations, a hot-decking11 randomization procedure was used. CPXs were assigned to persons who reported no health conditions based on an age-related, observed-frequencies basis drawn from probability samples. The purpose of these procedures was to adjust the overall yearly QWB total population average score to empirically reasonable levels for the expected distribution of symptoms or problems in the population. Persons with assigned CPXs but no NHIS condition would therefore be excluded from any analyses involving any specific disease—they would not qualify because they were assumed to have symptoms without underlying disease diagnosis.

RESULTS

Figure 1 summarizes the life expectancy for men and women using 1998 life tables. Starting at about age 20, the proportion of live women in the population exceeds live men, and this trend continues throughout the life expectancy. Women have a life expectancy from birth of 79.9 years, whereas men have a life expectancy of 74.3 years. Thus,
There is a 2.5-year female advantage for now or
when disability health status switches back and forth
between men and women, but men have a very
small overall advantage (0.2% or two hundredths of
0.1%). From ages 74 to 98, men have better overall
disability-modified health status scores at each age.

From ages 15 to 35 by 0.5%, from ages 50 to 73, the
main disability-modified health status scores are
higher for men than for women. Overall, disability
scores for men and women show that the
Figure 2 depicts the total improved QWB scores
when disability is expected.
to both symptoms in both CPX weight and dysfunction weight. This is consistent and is paralleled with the observation that women report 0.7845 medical conditions per person on average, which is significantly more conditions per person than reported by men (0.6347 conditions).

Figure 3 summarizes the QALE for men and women. This figure combines morbidity and mortality into a single index. The QALE was 59.5 years for men and 63.0 years for women. Thus, the 5.6-year advantage for women is reduced to 3.5 years when adjusted for quality of life. Figure 4 shows the difference between men and women on the combined index of morbidity and mortality throughout the life span. Early in life there is a slight female advantage. During the most active reproductive ages, there is a slight advantage of being a man. By age 40, the female advantage begins and accelerates until about age 80. During the last 20 years, curves for men and women come back together.

**DISCUSSION**

By using a data set involving nearly 1.9 million participants (with NHIS sampling weights), we estimated the QALE for men and women in the
Health and Human Services released Healthy People 2010. The central goals of Healthy People 2010 include 2 overarching objectives. The first objective is to increase the quality and years of life; the second objective is to eliminate health disparities.

As the report showed, life expectancy increased during the course of the 20th century. In addition to improving life expectancy, however, the objectives emphasize improvements in quality of life and set overall objectives for the United States in terms of years of healthy life (YHL). The term YHL refers to the same concept as quality-adjusted life years. The specific YHL measure used in the report is a combined index of morbidity and mortality, similar to the Health and Limitations Index (HALex) measure. The report noted that YHL decreased early in the 1990s but increased to a level in 1996 that was only slightly higher than that observed at the beginning of the decade. The reason for this variation is unknown.

Unfortunately, the YHL concept may be more sophisticated than the data that are actually available for estimating it. Although the term YHL is used in the first overall objective for the nation, there are problems in using this method for assessing this crucial objective. In particular, the YHL index is highly dependent on subjective self-ratings of health. Correlations between QWBX1 and HALEX overall scores (for years 1986 to 1988 and 1994 combined) are moderate (.5324); the strongest correlation (.7930) is between the dysfunction element of these indices. Although QWB and HALEX aim to describe similar target phenomena, they are defined and operationalized differently. The common variance between QWBX1 and HALEX (.5324 squared) is 28.34%.

A further concern with the adequacy of the HALEX measure is raised by the fact that lower-income respondents are more than 5 times more likely to report their health as fair or poor in comparison with people from the highest-income households. There are significant differences between men and women in reporting of symptoms and dysfunction. Nevertheless, women have better outcomes in terms of life expectancy. At present, we do not know the degree to which recorded disparities in YHL are determined by differences in this simple subjective self-rating of health or the extent to which demographic factors influence responses for items that affect QWBX1 scores. There is some evidence that women have more negative health perceptions of their own health for conditions comparable with men, but the magnitude of the effect is modest. The interpretation of self-reported health is a matter of some controversy. Some feel subjective reports that are not clearly correlated with more objective indicators have no place in a scientific measure. However, the authors of Healthy People 2010 objectives raise a challenging question. If a person does not feel healthy, have we achieved the objectives of health care?

In summary, women have a significant life expectancy advantage in comparison with men. With adjustments for quality of life, however, this advantage is reduced by 34%. Data combining multiple years from the NHIS may help address related issues. However, several technical limitations with these data must be resolved.

ACKNOWLEDGMENT

The authors thank the invaluable programming assistance of Norman I. Borgen. Without his help, QWBX1 work could never have been completed.

APPENDIX

Matching NHIS Activity Limitation Categories to QWB Social Activity Scale

An early report matched some NHIS activity limitation categories with some limitation categories from QWB and other health measures. The specific YHL measure used in the report is a method. Is The report noted that YHL decreased early in the 1990s but increased to a level in 1996 that was only slightly higher than that observed at the beginning of the decade. The reason for this variation is unknown.

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<td><strong>NHIS Activity and Restricted Activity Days Limitations Matched With QWB Social Activity Scale</strong></td>
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<td><strong>NHIS Activity Limitations</strong></td>
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<td>No limitations</td>
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<tr>
<td>Other limitations</td>
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<td>Limited in major activities</td>
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<tr>
<td>No major activities</td>
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<td><strong>NHIS Self-Care Limitations</strong></td>
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<td>Work-loss days (past 2 weeks)</td>
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<td>School-loss days (past 2 weeks)</td>
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REFERENCES

For SBP, WC, or THC levels in those with hypertension, we have included a 2-step process:
1. Assign a calculated WC using the gradient regression line (standardized SBP; 50th
percentile). WC is then in the range of WC thresholds recommended by the National
Cholesterol Education Program Adult Treatment Panel III (NCEP III). WC is then
compared to the WC threshold of 80 cm for men and 70 cm for women, and
any WC exceeding these thresholds is classified as hypertension.

Imitations are reported for people who do not report drinking soft drinks or alcohol.

Thus, for the study of HB, we have excluded participants who reported drinking 7 or
more alcoholic drinks per week or consuming 3 or more alcoholic drinks per
occasion. The HB distribution is highly skewed and may not be normally distributed.
Participants with a history of chronic illness or current medication use affecting
blood pressure were also excluded. The effect of these exclusions is minimally
reduces the difference in HB between groups, and the results are similar to the
original analyses presented in this report.

The inclusion of HB activity in the classification of hypertensive status was based
on the finding that HB activity is positively associated with blood pressure. HB
activity was measured using a wrist-worn accelerometer, and the data were
analyzed using a confirmatory factor analysis (CFA) approach. The CFA model
shows a significant association between HB activity and blood pressure, and
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