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Men: good health and high mortality. Sex differences in health and aging*

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Abstract

This review examines sex differences in health and survival, with a focus on the Nordic countries. There is a remarkable discrepancy between the health and survival of the sexes: men are physically stronger and have fewer disabilities, but have substantially higher mortality at all ages compared with women: the so-called male-female health-survival paradox. A number of proposed explanations for this paradox are rooted in biological, social, and psychological interpretations. It is likely to be due to multiple causes that include fundamental biological differences between the sexes such as genetic factors, immune system responses, hormones, and disease patterns. Behavioral differences such as risk-taking and reluctance to seek and comply with medical treatment may also play a role. Another consideration is that part of the difference may be due to methodological challenges, such as selective non-participation and under-reporting of health problems, and delayed seeking of treatment by men. The Nordic countries provide a unique opportunity for such studies, as they have good-quality data in their national health registers, which cover the whole population, and a long tradition of high participation rates in surveys.

Keywords

Health; mortality; Nordic countries; review; sex differences

INTRODUCTION

In the 8 April 2006 issue of the *British Medical Journal*, an editorial announced “Life expectancy: women now on top everywhere”. During 2006, even in the poorest countries, women could expect to outlive men (1). However, there is a remarkable discrepancy between the health and survival of men versus women. According to a recent report on health differences in 21 European countries, men rated their health higher than women in all but one country, Finland, with significant differences in 13 countries - among them three other Nordic countries, Sweden, Norway and Denmark (2). Research literature generally suggests that men are physically stronger, report fewer diseases and have fewer limitations in the activities of daily living at older ages. Nonetheless, female death rates are

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substantially lower than those for males at all ages. That is, in terms of mortality, women are healthier than men.

Interpreting this apparent contradiction - that women live longer than men but experience worse health - is complicated by several factors, and a number of explanations have been proposed that are rooted in biological, social and psychological interpretations. The most commonly proposed explanations are biological risks, risks acquired through social roles, lifestyle and illness behaviors, and differential healthcare access, treatment and use (3–8).

This review provides data documenting sex differences in health and survival, with a focus on the Nordic countries. It is followed by a section on methodological challenges and a final section on possible explanations for the paradox and suggestions for future research.

OBSERVED SEX DIFFERENCES IN HEALTH AND MORTALITY

Sex differences in mortality

As far back as the mid-18th century there was a female advantage in survival (9) and, with economic development and improved living conditions for women, the sex gap increased in the first three quarters of the 20th century in most Western countries (3, 4, 7), including Denmark and other Nordic countries (10, 11). However, in developed countries, the sex differences in mortality development were mixed in the last quarter of the 20th century. Female-male differences in life expectancy narrowed in most European countries and in the US over the period 1980–1996, but became larger in other countries, namely Greece, Hungary, the Russian Federation and Japan (12, 13). There is general agreement that cigarette smoking is the single largest identifiable factor, and also that this alone cannot explain the trajectories in sex differential mortality, which is illustrated by the sex difference in survival among those who have never smoked (14).

Sex differences in mortality in Nordic countries

This section describes the trends of sex differences in mortality in the four Nordic countries, Denmark, Finland, Norway, and Sweden, for 1950–2004, based on the Human Mortality Database (15) and the World Health Organization (WHO) Mortality Database (16). To ensure comparability, the mortality rates in the four Nordic countries were standardized according to the European standard population. Most of the disease-specific comparisons were based on truncated age groups (35–74 years) to minimize the risk of different coding practices, especially among the elderly.

During the period 1850–1950, the sex difference in life expectancy in Denmark, Norway and Sweden was 2–4 years (Fig. 1). The difference increased to 6–7 years between 1950 and 1980, and then decreased to 4.5–5 years. The sex ratio for all-cause mortality (ratio between age-standardized mortality rates) showed the same pattern since 1950 as the sex difference in life expectancy (Fig. 1). This pattern was slightly different for Finland: an increase in the sex gap began in the 1920s, and was somewhat greater than in the other Nordic countries and more affected by World War II.

The age-specific trajectories of mortality rates for 1950–2005 (Fig. 2) show that infant mortality was consistently 20–30% higher for boys than girls. Sex differences were slightly greater among 1–14-year olds, and varied very little in the 50-year period. Men aged 15–24 years had about twice the mortality of women in the early 1950s. Thereafter, the sex ratio increased slightly in all four countries. Mortality differences in the 25–44-year and, especially, 45–64-year age groups followed nearly the same pattern as the difference in life expectancy. In the 65–84-year age group, the sex ratio was small in the 1950s, but increased in all four countries until 1980. Lastly, in the oldest age group, there was almost no sex

difference in mortality rates at the beginning of the period but, since 1975, it has been constant and similar in all four countries, with men having about an increased mortality risk of 17–29% (which is a substantial absolute difference, given high mortality rates at age 85 or over).

There were substantial variations in sex differential mortality at the disease-specific level (Fig. 3). Sex ratios for mortality from stomach, colon and rectum cancer were similar in all countries and over time. In contrast, sex differences in mortality from ischemic heart disease, other heart diseases and diabetes substantially increased since 1950 and clearly contributed to the change in the sex difference in life expectancy in all four countries. There were huge sex differences in mortality from lung cancer, traffic accidents and suicide. Since 1970, the differences from lung cancer have decreased in all four countries, but the decline was much steeper in Finland. Sex ratios for liver cirrhosis and traffic accidents also changed greatly since 1950, although in the opposite direction.

In conclusion, all Nordic countries have had similar patterns of age-specific sex differences in all-cause mortality since 1950, except that Finnish men have had higher excess mortality than the other three countries in the 25–44- and 45–64-year age groups. The most marked changes in sex differences over 1950–2004 were in the 25–44-, 45–64- and 65–84-year age groups, suggesting that these groups have been responsible for most changes in sex differences in life expectancy since 1950. Trajectories of sex differences in cause-specific mortality had similar patterns in the four countries. Notable changes in the sex ratio for all-cause mortality within the last 50 years can mainly be attributed to diseases and causes of deaths closely related to lifestyle and health behaviors interacting with living conditions, i.e., ischemic heart disease, other heart diseases, lung cancer, liver cirrhosis, traffic accidents, and suicide.

Sex differences in self-reported health, activities of daily living and physical performance tests

Most research papers consistently find poorer self-reported health and a lower quality of life among women compared with men, although some studies have been unable to detect substantial sex differences in self-reported health (17–19). Women also have more difficulties in performing activities of daily living (ADL), due to a higher incidence and prevalence of disability than men at all ages (20, 21). Case and Paxson showed that men and women with the same conditions had similar self-reported health, but men had higher mortality from these conditions, indicating greater severity (8). The “male advantage” in physical health has also been revealed with physical performance tests. Grip strength predicts disability, morbidity and mortality in both sexes, and the mean grip strength of elderly men is still comparable to that of middle-aged women (22). There are large statistically significant sex differences in physical health in populations as diverse as the Danish and Chinese oldest-old populations (19, 23). The female disadvantage is larger for nonagenarians and centenarians than octogenarians, suggesting that sex differences in disability become more pronounced at advanced age. In conclusion, men are physically stronger and have fewer limitations in ADL, factors that are significantly associated with better survival in both sexes, yet men have higher mortality than women at all ages.

Sex differences in morbidity

The issue of sex differences in morbidity is more complex than the pattern of sex differences in ADL and physical performance tests. The complexity is due to variations in definitions of diseases, diagnostic procedures and age-related changes in incidence rates for many diseases. For example, the incidence of coronary heart disease (CHD) starts rising about 10 years earlier for men than women and, in middle-age, it is about twice as high for men than

women. However, the male excess of CHD incidence and mortality declines after 60, and after 80 the difference is small (24–26). Studies generally show that women have a significantly higher mean number of reported symptoms, prevalence of migraine, musculoskeletal and autoimmune diseases, whereas men have an earlier and higher incidence of cardiovascular diseases (27, 28). A study of different-sex twins, which controls for childhood environment and, to some extent, genetic factors, showed that men reported more very life-threatening conditions, such as heart insufficiency, angina pectoris, thrombosis in leg, and others, whereas women reported more total health conditions, non-life-threatening conditions, and physical and psychological symptoms (29). This suggests that excessive morbidity in women depends highly on a selected disease or illness indicator.

Severity of diseases may also interfere with female-male differences. Some studies found substantially higher risk of severe coronary artery calcification score and intima-media thickness in men of most ages, but the risk of severity was similar in women and men when ankle-arm index and degree of aortic calcification were used (30). Acute myocardial infarction was more severe in women for some severity measures, but when other indicators were applied, men were rated to be as sick as, or sicker than women (31).

The frequency and outcomes of percutaneous coronary interventions (PCI) and coronary artery bypass graft surgery (CABG) may also serve as proxies for disease severity. Considerably more men undergo PCI and CABG than women, and gender inequity increases with age (32, 33). Such differences in disease management are partially due to differences in symptom presentation, patient preferences for surgical or conservative treatment, selective referral for invasive procedures favoring men, and more beneficial results of invasive management in men than women (34, 35). A recent review pointed out that modern technological advances (e.g., PCI accompanied by stent insertion, development of drug-eluting stents, and atherectomy devices) diminished or eliminated sex differences in the operative and 1-year mortality rates (36). However, the male advantage in hospital and post-operative mortality after PCI and CABG surgery is still debatable.

To sum up, it is well-established that, in terms of mortality, women are healthier than men at all ages, but have higher disability levels than men. Sex differences in morbidity remain unclear, as they depend on disease definition, severity measure used, and age trajectories of particular diseases.

METHODOLOGICAL CHALLENGES IN STUDIES OF SEX DIFFERENCES IN HEALTH AND MORTALITY

Sex differences in reporting

The research literature on sex differences in the accuracy of self-reports is divisive. In the Longitudinal Aging Study of Amsterdam, the accuracy of information provided by patients was moderate to high for most selected chronic conditions: men tended to under-report health problems, whereas women more frequently over-reported malignancies and arthritis (37). Other studies in the US revealed that women's self reports were in greater agreement with medical records for myocardial infarction, diabetes, hypertension and stroke (38). Zhu et al. reported that men stated more histories of urinary tract infection, sexually transmitted diseases and some other conditions than were identified in medical records (39). In a study of middle-aged men, the self-reports agreed well with general physician (GP) records for angina, and the disagreement was mainly from over-reporting of angina (40).

The Seattle Longitudinal Study suggests that, for women, there is lower agreement between self-reported drugs and pharmacy data, and more errors in both sources of medication use when compared with men (41). The recall accuracy among elderly women was highest for

antihypertensive and statin medications and lowest for anti-depressants (42). Other Dutch and US studies found no significant sex differences in recall accuracy for alimentary, central nervous system, cardiovascular system and non-steroid anti-inflammatory medications (43, 44). Such discrepancies in results regarding sex differences in reporting patterns are expected, considering differences in sample age structure, sample size, and methodological approaches employed in studies.

Sex differences in participation

Empirical evidence on differences in survey participation by sex of the respondent is inconsistent. There were lower participation rates for women in several population-based studies of the elderly in Denmark (45, 46). Some Nordic studies could not detect sex differences in survey participation rates (47–49). A review on attrition rates in longitudinal studies of the elderly reported that few studies found higher non-response among women (50). Furthermore, in the Finnish and Dutch working-age populations, the participation rate was higher for women than men (51, 52). Jacomb et al. found that the sex differential in response pattern changed as their study progressed (53). In the baseline survey, elderly women were more likely to refuse study participation, although no sex difference in participation rates was observed during follow-up surveys.

Regarding age differences in response rate, the literature predominantly reports lower participation rates with increased age (50). However, some studies found no differences in the response pattern with age (54) and others reported lower response rates among younger subjects (51, 55). Furthermore, one US and one Danish study demonstrated that, among younger individuals, a non-response was more common among men, whereas men over 60 years had more active participation in surveys than women (56, 57).

There has been much effort on assessing the representativeness of study samples by comparing the health status of participants with that of the general population and non-respondents. Many studies report that participants were more likely to have higher cognitive status (49, 53), higher ratings of general health, lower levels of physical disabilities (58) and to be free from chronic illness (59) compared with non-respondents. This suggests that participants were healthier than non-participants.

Other studies of non-responses used healthcare utilization as the operational measure of morbidity. Among Danes aged 70–75, a higher proportion of non-respondents were hospitalized within one year prior to study, but there were no differences in healthcare use indicated by the response pattern in the 12 years prior to the interview (47). Using the national Danish register data, Kjoller and Thoning analyzed differences in hospital admission rates by response status at 5 years before, 6 months before and 2 years after data collection. The only statistically significant differences favoring participants were in the hospitalization rate 6 months prior to the survey (57). Other population-based studies in Denmark and the Netherlands did not detect differences in the prevalence or number of diagnosed somatic disorders by response pattern, but psychological problems were significantly more frequent among non-respondents (48, 60). Similarly, none of the healthcare use variables were predictive of non-response among US Medicare beneficiaries 65 years old and older in a multivariate analysis (61).

Investigators in Switzerland and Sweden found that the proportion of people with healthcare expenditures greater than “zero” was higher among participants than non-respondents (54, 55). Those with higher healthcare use, such as more frequent visits to GPs, specialists or alternative medical practitioners, were more likely to participate in a health examination survey in the Netherlands (59). No differences in the use of inpatient care were indicated by the response pattern, although for all other types of healthcare, users were more likely to be

participants (56, 62). This suggests that “worried well”, i.e., healthy individuals making frequent use of health care services, were more likely to respond.

A potential source of sex bias in surveys may be the exclusion of nursing home populations, use of proxy respondents, and interviewers themselves. In a systematic literature review of attrition rates in longitudinal studies of the elderly, only 2 out of 19 studies included the residents of nursing homes and sheltered accommodation (50). It has been demonstrated that proxy respondents are mainly women, and that female interviewers elicited more information than male interviewers (63). Some studies suggested that lay proxy respondents tend to over-report physical disabilities and cognitive function and under-report the quality of life, compared with the respondents themselves (64, 65). However, little is known about whether the exclusion of institutionalized populations, who generally have poorer health than same-age non-institutionalized counterparts, and of proxies, who are often spouses, confounds the analysis of sex differences in response patterns and health assessments in surveys.

As illustrated in this short literature overview, the health characteristics of non-respondents to surveys were mixed and dependent on age, cohort, country and sex. It is not clear whether the sex differences in participation and reporting are important for the differences in health between men and women.

EXPLANATIONS FOR SEX DIFFERENCES IN HEALTH AND MORTALITY

The most widely cited explanations for the male-female health-survival paradox include biological endowments, risks acquired through social roles and behaviors (including illness and health reporting behaviors), physicians’ diagnostic patterns, and differential healthcare access, treatment and use.

Biological explanations

The most prominent biological explanations for the health-survival paradox are hormonal, autoimmune and genetic (66). The increase in cardiovascular disease in men approximately 10 years before women, combined with the favorable effect of estrogen on serum lipids (67) and its protective effect on brain cells (68) and consequent prevention of degenerative processes, has led to the hypothesis that estrogen is a central factor in the paradox. Endogenous estrogen decreases serum low-density lipoprotein cholesterol and increases high-density lipoprotein cholesterol levels, lowering the CHD risk in women of reproductive age. The widely accepted opinion that hormonal replacement therapy (HRT) decreases the CHD risk for post-menopausal women has been challenged since publication of the principal results of randomized clinical trials of HRT in post-menopausal women (69, 70). The Women’s Health Initiative (WHI) trial revealed an excessive risk of CHD events, pulmonary embolism, stroke and breast cancer among post-menopausal women receiving estrogen plus progestin compared with a placebo group, although the protective effect of HRT for colorectal and endometrial cancers and osteoporosis was also indicated (69, 70). An ancillary substudy of the WHI trial indicated that young post-menopausal women with estrogen treatment alone had lower coronary artery calcification and, thus, risk of coronary events, compared with a placebo group (71). The researchers suggested that estrogen therapy reduced the calcified plaque burden of coronary arteries in young post-menopausal women who were still free from atherosclerosis. However, due to its complex effects on the cardiovascular system, estrogen may elevate the CHD risk due to increased likelihood of thrombosis and plaque rupture in older women with advanced atherosclerosis (72). Recently, Barrett-Connor argued against the timing hypothesis, commenting that the evidential support from clinical trials was weak (73). The estrogen hypothesis does not explain the sex differences at older ages, when menopause occurred decades ago and where the sex

differences in cardiovascular diseases are very modest. More research is needed to reveal stronger evidence that estrogen partially explains sex differences in health and mortality.

The evidence of risks and benefits of testosterone replacement therapy in men is under debate (74). The latest research indicates no beneficial or harmful effects of low-dose testosterone replacement on body composition, physical performance, insulin sensitivity or quality of life in men (75).

The “immunocompetence” hypothesis is that increased male mortality throughout life may partly be due to the greater susceptibility of men to infections (76, 77). Indeed, some data indicate that men have higher mortality due to parasitic and infectious diseases. Conversely, because testosterone causes immunosuppression, it has been suggested that men have a lower likelihood of producing autoantibodies and, hence, of having autoimmune diseases, which predominantly occur in women (76).

According to the X-chromosome hypothesis, the lack of a second X chromosome in men is associated with increased mortality. Studies of peripheral blood cells from elderly monozygotic female twins show a strong tendency for the same cell line to become predominant in two co-twins, which suggests that X-linked genetic factors influence human hematopoietic stem-cell kinetics and, potentially, organism survival. The fact that women have two cell lines with different potentials may be one reason why they live longer than men (66, 78).

Sex differences in health transitions

Studies of younger elderly people suggest that the rate-of-change in physical and cognitive functioning is associated with longevity (79). Women aged 65 years and over had a greater rate of decline in physical function and were less likely to recover from disability than men (80). The sex differences in recovery rates were largest among nonagenarians (21). However, the data are sparse among the oldest-old, due to logistical challenges (high mortality and non-response), but available data suggest that, although the level of functioning is predictive of survival, the rate of decline is also important. The decline-mortality association is central in ‘terminal decline research’, and it has been found that poor cognitive functioning among elderly individuals is associated with impending death (81). The effects of level and rate-of-change are mixed and may vary with age. The inconsistent results may be a consequence of the fact that most of these studies had few participants with three or more assessments, which creates difficulties in studying sex differences by means of latent growth curve modeling and transition models.

Little is known about sex differences in the rate-of-change in physical and cognitive function and recovery rates in the oldest population. It is unclear to what extent the health-survival paradox is due to different transition rates from an ‘unhealthy state’ to death or a ‘healthy state’ for men and women. It is possible that ‘unhealthy’ men have higher mortality rates and that the sex difference in transition rates depends on how ‘unhealthy’ is defined (disabilities *vs* diseases, self-report *vs* measured *vs* healthcare use). There is evidence that incidence, recovery and mortality influence the sex difference in disability prevalence, and that incidence has the greatest impact (21). It is also not clear whether level or rate-of-change (relative or absolute) is the best predictor of subsequent survival. If absolute rate-of-change is the most predictive, this may explain part of the health-survival paradox, as men have the largest absolute decline.

Sex differences in lifestyle behavior

Research has consistently demonstrated that men engage more frequently in higher risk-taking behaviors, such as cigarette smoking, alcohol consumption, more frequent use of

psychoactive substances, and less safe driving, which all increase the risks of CHD, lung cancer, chronic obstructive pulmonary diseases, liver cirrhosis, and accident fatalities in comparison with women (7, 13). Although the prevalence of smoking has declined in recent years in both sexes in most European countries, the decrease was smaller in women than men (82). The US data for 1999–2004 suggest that the increasing trend of being overweight was more pronounced among men and was leveling off in women (83). Similarly, in Sweden in 1985–2002, the percentage of overweight individuals was always higher in men than women, and the increase in body mass index was more pronounced in men, whereas abdominal obesity increased mainly in women (84). Several studies have shown that women are more likely than men to choose low-fat foods, consume less meat and more fruit and fiber, and limit salt intake (85, 86), but men are more physically active than women (87). Although unhealthy behaviors contribute to the increased risk of cardiovascular and other chronic diseases and mortality in men, they cannot fully explain sex differences in health and mortality. This is suggested by sex differential mortality in the studies restricted to populations with a particular health profile, such as old Amish (88) and Mormons (89, 90).

Sex differences in social roles and health behavior

Wingard argued that sex differences in morbidity and mortality may be partially attributed to sex differences in risks acquired through social roles and behaviors, such as reporting, illness and help-seeking behaviors (5). Since women were traditionally more responsible for family health and knowledgeable about pathological signs, they had a higher propensity to use healthcare services than men. Gender stereotypes and related social norms made it culturally more acceptable for women to be sick, report more health problems and get advice about illness, suggesting that sex differences in health could be partially attributed to gender role expectations and responsibilities. Several studies found that women reported significantly higher mean numbers of symptoms (91), had more interest in health and slightly more absent days from work compared with men (92). Women reported more trivial and often medically unexplained symptoms (93) and all types of symptoms (94). A recent UK study showed that men with higher ‘femininity’ scores had a lower risk of death from CHD, whereas there was no similar relationship for women, suggesting that men with more stereotypical ‘masculine’ behavior were at higher risk of premature mortality (95).

To contrast the hypothesis that the sick role is more compatible with women, it has been proposed that a woman’s illness is more detrimental for the entire family, due to the greater burden of household responsibilities on women (96). In addition, there was little or no evidence of sex differentials in the number of reported physical symptoms (e.g., painful joints) and seeking medical care for diseases requiring prompt medical intervention, such as cancer (27). More frequent reporting by women occurred only in the number of malaise-type symptoms (e.g., sleep problems or concentration difficulties). A UK study found no evidence that women more readily reported trivial or mental health problems compared with men (97). Some authors suggest that occupational and socio-economic status and conditions are important factors influencing help-seeking behavior when individuals face illness. The Whitehall II study showed that a lower employment grade was associated with higher rates of short- and long-term absence, and that 50% of women were employed in the clerical and office support grades compared with 9% of men (98). The adjustment for employment grade revealed excess absenteeism in men in several disease categories. Other scholars found that employed, married parents had better health than unemployed single women and men without children (99). Additionally, contemporary industrial societies with gender-equality oriented policies have broken the traditional distribution of sex roles, and have more fathers with household responsibilities and caring for children and more women working.

Sex differences in healthcare utilization

Previous research has indicated the higher utilization of healthcare services by women compared with men, although sex differences fall for more serious health problems or hospital admissions (93, 100). Although differences in reproductive biology are important in explaining sex differences in healthcare utilization, being a woman predicts higher use of health services if sex-specific conditions are removed (6, 92). Women had significantly higher mean numbers of visits to primary care and diagnostic clinics compared with men, although the mean number of hospitalizations was similar (101, 102). Analysis of the national Danish Registry data showed that men had a lower rate of primary care use, but a higher hospitalization rate than women (103), suggesting that Danish men disregarded early signs of disease and the importance of preventive measures. They seem to postpone going to a physician until the later stages of disease development, which require more complex interventions, and are less effective for long-term survival and more costly. A review also suggested a trend of delayed help-seeking behavior in men (104).

The use of prescription medicines was more common among women in the Nordic and other populations, even when reproduction-related medications were excluded (105–107). Women used more anti-anxiety, anti-depressant, diuretic, and non-steroid anti-inflammatory drugs, but less pulmonary medications compared with men. Cardiovascular agents were the most commonly used medications in both genders at age 65 and over, although men used cardiovascular system medication, except diuretics, more often and from earlier ages than did women.

CONCLUSIONS

Although the male-female health-survival paradox has been studied for decades, we still do not fully understand either the reasons for it or its mechanisms (66). There are probably multiple causes, including fundamental biological differences between the sexes, such as genetic factors, immune system response, hormones, and disease patterns. Behavioral differences such as risk-taking or reluctance to seek and comply with medical treatment also probably play a role. Some of the differences may be due to delays in seeking treatment by men, or bias in surveys, if men are more reluctant than women to participate and/or accurately report in surveys, if they have disabilities or diseases. Quantifying the effects of these proposed mechanisms are important research topics that need more attention to shed light on the male-female paradox of health and survival. If further research suggests that heightened male hospitalization and mortality is partially due to delayed treatment seeking, then factors affecting the seeking of medical help should be carefully studied and appropriate measures taken to improve men's illness behavior. If women have a more rapid transition from 'healthy' to 'unhealthy' states and a lower probability of recovery compared with men, then future research should focus on identifying contributing factors and designing strategies to prevent disability and improve the quality of life of elderly women. The Nordic countries, with their long tradition of surveys with high participation rates and comprehensive national health registers, are excellent settings for such studies.

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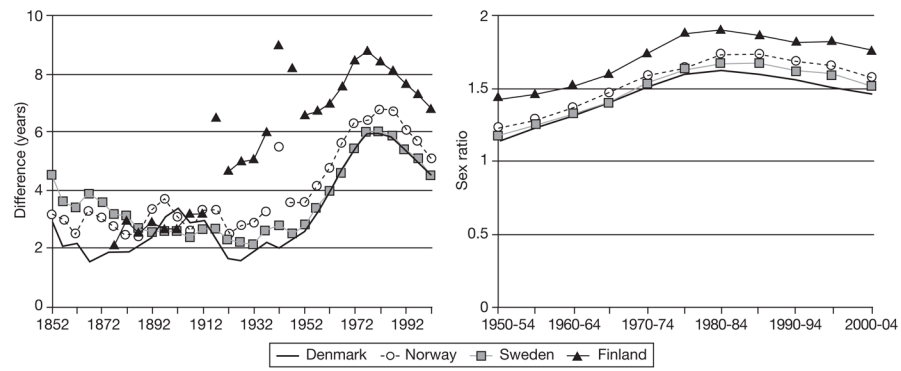


Fig. 1. Difference in life expectancy between females and males (1850–2005) and sex ratio for all-cause mortality (ratio between age-standardized mortality rates) in four Nordic countries (1950–2005).

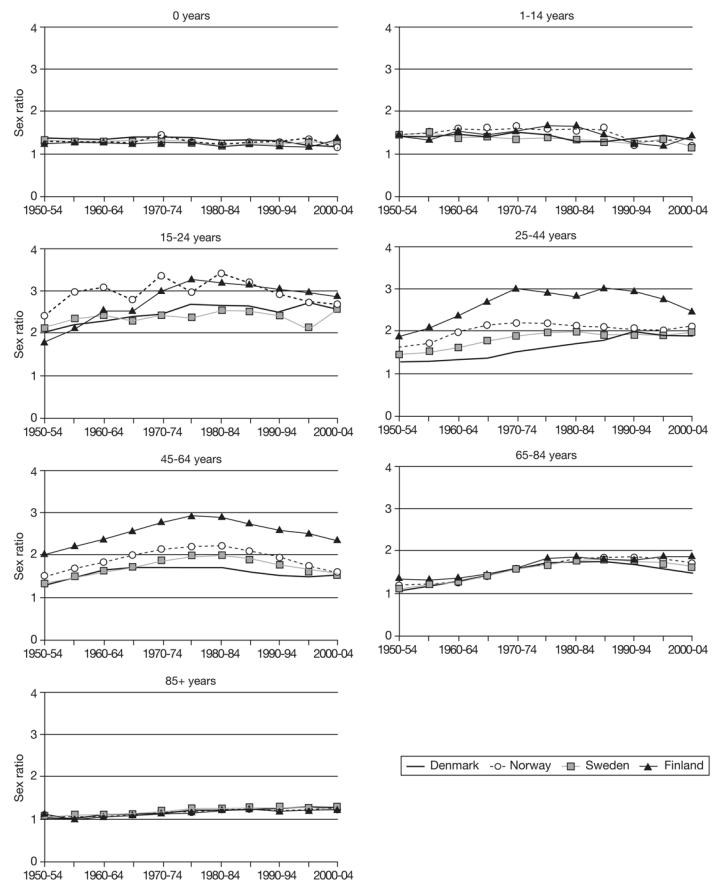


Fig. 2. Sex ratio for all-cause age-specific mortality (ratio between age-standardized mortality rates) in four Nordic countries, 1950–2005.

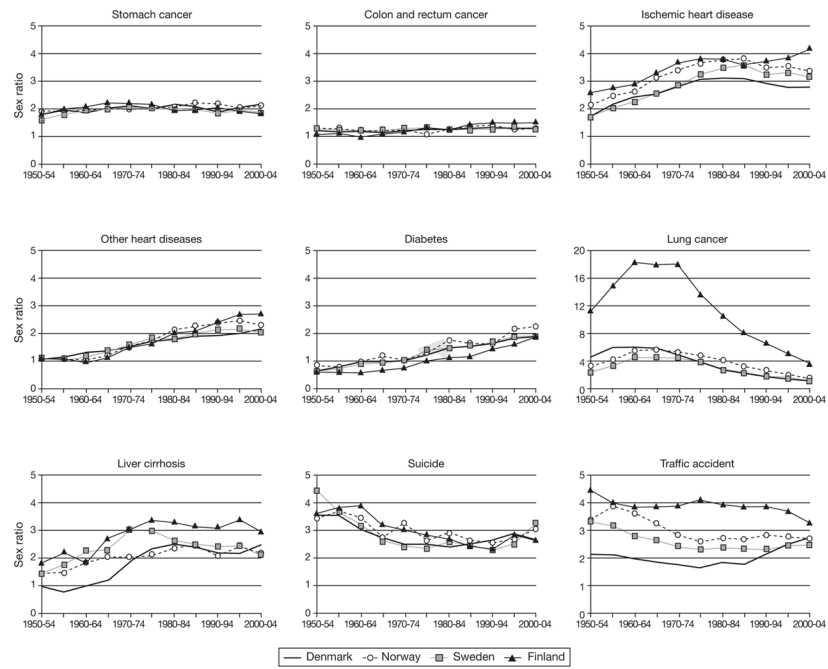


Fig. 3. Sex ratios for cause-specific mortality rates (ratio between age-standardized mortality rates) in four Nordic countries (35–74 years), 1950–2005.