

Mortality Among Men and Women in Same-Sex Marriage: A National Cohort Study of 8333 Danes

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Numerous reports have addressed the excess mortality among gay men who are HIV infected or who have AIDS.¹ The remarkable decline in mortality following the introduction of highly active antiretroviral treatment (HAART) regimens since 1996 has also been well documented.^{2,3} However, there is a lack of methodologically sound studies on whether mortality among gay men who are not directly affected by the HIV/AIDS epidemic (the majority of gay men) is any different from that of the general male population. Likewise, despite recent calls for increased attention to the health needs of sexual minority groups,^{4,5} no population-based study has provided data on the overall mortality among lesbians. One major practical reason that mortality has not been studied in these groups, whose basic human rights remain controversial in many countries, is the difficulty identifying large and unbiased groups of gay men and lesbians. Further stressing the need for a thorough investigation, a recent Internet-based publication used flawed methodology to arrive at the conclusion that life expectancies for gay men and lesbians are, on average, shorter than those of heterosexual men and women by more than 20 years.⁶

Our goal was to provide a population-based estimate of the overall mortality in a well-defined, complete cohort of gay and lesbian persons without obvious health-related characteristics that would lead to biased mortality estimates. We utilized favorable opportunities for conducting nationwide epidemiologic studies in Denmark to identify a cohort of more than 8000 persons whose only eligibility criterion was that they had formalized their partnership in same-sex marriage.

METHODS

In 1989, the Danish parliament was the first in the world to pass a law allowing registered homosexual partnerships, i.e., same-sex marriages, that provided same-sex couples with legal rights resembling those of people in heterosexual marriages.⁷ We used the Civil

Objectives. We studied overall mortality in a demographically defined, complete cohort of gay men and lesbians to address recent claims of markedly shorter life spans among homosexual persons.

Methods. We calculated standardized mortality ratios (SMRs) starting 1 year after the date of same-sex marriage for 4914 men and 3419 women in Denmark who married a same-sex partner between 1989 and 2004.

Results. Mortality was markedly increased in the first decade after same-sex marriage for men who married between 1989 and 1995 (SMR=2.25; 95% confidence interval [CI]=2.01, 2.50), but much less so for men who married after 1995, when efficient HIV/AIDS therapies were available (SMR=1.33; 95% CI=1.04, 1.68). For women who married their same-sex partner between 1989 and 2004, mortality was 34% higher than was mortality in the general female population (SMR=1.34; 95% CI=1.09, 1.63). For women, and for men marrying after 1995, the significant excess mortality was limited to the period 1 to 3 years after the marriage.

Conclusions. Despite recent marked reduction in mortality among gay men, Danish men and women in same-sex marriages still have mortality rates that exceed those of the general population. The excess mortality is restricted to the first few years after a marriage, presumably reflecting preexisting illness at the time of marriage. Although further study is needed, the claims of drastically increased overall mortality in gay men and lesbians appear unjustified. (*Am J Public Health.* 2009;99:133–137. doi:10.2105/AJPH.2008.133801)

Registration System, a centralized and continuously updated electronic database that keeps track of demographic changes (including marital status) in the entire Danish population⁸ to identify 8667 persons who married a same-sex partner between October 1, 1989, and July 15, 2004. Because of insufficient follow-up data, we excluded 31 persons who had emigrated from Denmark at the time of their marriage. Furthermore, 303 persons with less than 1 year of follow-up were excluded because we disregarded the first year after marriage from all mortality calculations to reduce the influence of deaths from severe diseases that were present at the time of marriage and that may have contributed to the decision to marry. Thus, the study cohort consisted of 8333 persons (4914 men, 3419 women) who were followed after 1 year of their first same-sex marriage until death, emigration, or end of follow-up (July 15, 2005).

We used measures of relative and excess mortality to compare overall mortality rates among persons in same-sex marriages with those of the general Danish population. The

standardized mortality ratio (SMR), defined as the ratio of observed to expected numbers of deaths, is a frequently used summary measure of relative mortality. The excess death rate (EDR), defined as the observed minus the expected number of deaths per 1000 person-years of observation, is useful when comparing groups with different baseline mortality rates. We calculated overall, marital age-specific (≤ 35 or > 35 years at first same-sex marriage), and period-specific (first same-sex marriage in 1989–1995 or 1996–2004; 1996 was the year HAART regimens dramatically improved survival of patients with HIV/AIDS) SMRs and EDRs with accompanying 95% confidence intervals (CIs), thus comparing mortality rates among persons in same-sex marriages with those of the general Danish population. Expected numbers of deaths in the cohort (denominators of the SMRs) were estimated by adding the gender-, age- and time period-specific contributions (1-year age and 5-year time period-specific stratifications) of person-years of observation multiplied by

corresponding gender-, age- and time period-specific death rates in the general population. SMRs whose 95% CIs excluded unity (i.e., 1.00) were considered to be statistically significant.

RESULTS

Overall Mortality, 1990–2005

During 60 316 person-years of observation starting 1 year after a same-sex marriage, 618 deaths (518 in men, 100 in women) occurred in the cohort, yielding crude mortality rates of 13.5 and 4.6 per 1000 person-years among men and women, respectively. These mortality rates were significantly higher than corresponding rates in the general Danish population (for men: SMR=1.78; 95% CI=1.63, 1.94; for women: SMR=1.34; 95% CI=1.09, 1.63; Table 1). In terms of excess deaths, persons in same-sex marriages experienced 5.92 and 1.15 extra deaths per 1000 person-years among men and women, respectively, compared with death rates in the general Danish population. Among both men and women, there was a pattern of declining SMRs and EDRs over time

after the first same-sex marriage. For men, mortality was 165% higher than in the general male population during the 1- to 3-year period after the marriage (SMR=2.65; 95% CI=2.28, 3.06; n=187 deaths) but gradually diminished to general population levels in the 13 to 14 years after the marriage (SMR=1.02; 95% CI=0.70, 1.42; n=34 deaths). For women, mortality was 91% higher in the period 1 to 3 years after the marriage (SMR=1.91; 95% CI=1.36, 2.60; n=40 deaths), but mortality rates did not deviate significantly from those of the general female population in subsequent periods 4 or more years after the marriage (n=60 deaths).

Mortality by Age at First Same-Sex Marriage

As shown in Table 1, EDRs were quite similar among men who were 35 years or younger or were older than 35 years at their first same-sex marriage (EDR=6.27 vs 5.64 excess deaths per 1000 person-years, respectively). However, because of lower background mortality rates in the younger category, SMRs were

markedly different (5.15 for the younger group [95% CI=4.30, 6.11; n=131 deaths] vs 1.46 for the older group [95% CI=1.32, 1.61; n=387 deaths]). Among women, differences between those who were 35 years or younger and those who were older than 35 years at their first same-sex marriage were smaller, with SMRs of 2.04 (95% CI=1.21, 3.22; n=18 deaths) and 1.24 (95% CI=0.99, 1.54; n=82 deaths), respectively.

Mortality by Period of Same-Sex Marriage

To evaluate the impact of HIV/AIDS-associated mortality on overall mortality among men, we subsequently calculated SMRs and EDRs for the first decade (1–9 years) after same-sex marriage in 2 calendar periods (Table 2). The first period covered men who married during the pre-HAART period of 1989 to 1995. The second period covered men who married between 1996 and 2004, when HAART was available to treat patients with HIV/AIDS. For those who entered same-sex marriage in the pre-HAART period, the overall SMR 1 to 9 years later was 2.25 (95%

TABLE 1—Standardized Mortality Ratios (SMRs) and Excess Death Rates (EDRs) Among 4914 Men and 3419 Women Who Married a Same-Sex Partner Between October 1, 1989, and July 15, 2004, by Gender, Age, and Time Since Same-Sex Marriage: Denmark

Time Since Same-Sex Marriage, y	Age ≤ 35 y at Same-Sex Marriage			Age > 35 y at Same-Sex Marriage			Total	
	Deaths (person-years)	SMR ^a (95% CI)	EDR ^b (95% CI)	Deaths (person-years)	SMR ^a (95% CI)	EDR ^b (95% CI)	SMR ^a (95% CI)	EDR ^b (95% CI)
Men								
1-3	58 (6071)	8.07 (6.12, 10.43)	8.37 (6.07, 11.17)	129 (7127)	2.03 (1.70, 2.42)	9.20 (6.21, 12.61)	2.65 (2.28, 3.06)	8.82 (6.86, 11.00)
4-6	45 (4579)	7.12 (5.19, 9.52)	8.45 (5.79, 11.77)	96 (5546)	1.54 (1.25, 1.88)	6.06 (2.78, 9.89)	2.05 (1.73, 2.42)	7.14 (4.94, 9.64)
7-9	11 (3296)	2.01 (1.00, 3.59)	1.68 (0.00, 4.31)	69 (4277)	1.18 (0.92, 1.50)	2.50 (-1.08, 6.78)	1.25 (0.99, 1.56)	2.14 (-0.05, 4.72)
10-12	13 (2069)	3.06 (1.63, 5.23)	4.23 (1.29, 8.69)	63 (3026)	1.25 (0.96, 1.60)	4.21 (-0.61, 10.02)	1.39 (1.10, 1.75)	4.22 (1.05, 7.97)
13-14	4 (827)	1.81 (0.49, 4.63)	2.16 (-1.35, 9.71)	30 (1539)	0.96 (0.65, 1.37)	-0.83 (-7.17, 7.50)	1.02 (0.70, 1.42)	0.22 (-4.20, 5.93)
Total	131 (16842)	5.15 (4.30, 6.11)	6.27 (4.99, 7.72)	387 (21515)	1.46 (1.32, 1.61)	5.64 (3.89, 7.52)	1.78 (1.63, 1.94)	5.92 (4.78, 7.13)
Women								
1-3	7 (4497)	2.76 (1.11, 5.69)	0.99 (0.06, 2.64)	33 (4231)	1.79 (1.23, 2.52)	3.45 (1.02, 6.60)	1.91 (1.36, 2.60)	2.18 (0.87, 3.84)
4-6	6 (3001)	2.71 (1.00, 5.90)	1.26 (0.00, 3.61)	14 (3077)	0.85 (0.47, 1.43)	-0.79 (-2.85, 2.30)	1.07 (0.66, 1.66)	0.23 (-1.06, 2.02)
7-9	2 (1915)	1.04 (0.13, 3.77)	0.04 (-0.88, 2.77)	14 (2043)	0.98 (0.53, 1.64)	-0.17 (-3.28, 4.48)	0.98 (0.56, 1.60)	-0.07 (-1.80, 2.46)
10-12	3 (1089)	2.08 (0.43, 6.08)	1.43 (-0.76, 6.72)	12 (1239)	1.05 (0.54, 1.83)	0.42 (-4.26, 7.65)	1.16 (0.65, 1.91)	0.89 (-1.94, 5.08)
13-14	0 (384)	0.00 (-, 5.14 ^c)	-1.87 (-, 7.73 ^c)	9 (482)	1.68 (0.77, 3.19)	7.55 (-2.58, 24.32)	1.48 (0.68, 2.81)	3.37 (-2.27, 12.71)
Total	18 (10887) ^d	2.04 (1.21, 3.22)	0.84 (0.17, 1.80)	82 (11073) ^d	1.24 (0.99, 1.54)	1.44 (-0.07, 3.23)	1.34 (1.09, 1.63)	1.15 (0.30, 2.13)

Note. CI = confidence interval

^aSMRs are the ratios of observed to expected numbers of deaths.

^bEDRs are the observed minus the expected number of deaths per 1000 person-years.

^cOne-sided confidence interval given because there were no deaths during the 13 to 14 years after first same-sex marriage among women who married at or before age 35 years.

^dFigures do not add to total shown because of rounding.

TABLE 2—Standardized Mortality Ratios (SMRs) and Excess Death Rates (EDRs) Among 4914 Men Who Married a Same-Sex Partner Between October 1, 1989, and July 15, 2004, by Date of and Time Since Same-Sex Marriage: Denmark

Time Since Same-Sex Marriage, y	Same-Sex Marriage Occurring October 1989–December 1995			Same-Sex Marriage Occurring January 1996–July 2004		
	Deaths (person-years)	SMR ^a (95% CI)	EDR ^b (95% CI)	Deaths (person-years)	SMR ^a (95% CI)	EDR ^b (95% CI)
1–3	151 (6933)	3.32 (2.82, 3.90)	15.23 (11.89, 18.99)	36 (6244)	1.43 (1.00, 1.98)	1.74 (0.01, 3.95)
4–6	115 (6445)	2.28 (1.88, 2.74)	10.02 (6.91, 13.60)	26 (3680)	1.42 (0.93, 2.09)	2.10 (–0.35, 5.39)
7–9	72 (6093)	1.32 (1.03, 1.66)	2.84 (0.27, 5.91)	8 (1479)	0.88 (0.38, 1.73)	–0.76 (–3.83, 4.49)
Total	338 (19471)	2.25 (2.01, 2.50)	9.63 (7.83, 11.58)	70 (11404)	1.33 (1.04, 1.68)	1.53 (0.18, 3.15)

Note. CI = confidence interval

^aSMRs are the ratios of observed to expected numbers of deaths.

^bEDRs are the observed minus the expected number of deaths per 1000 person-years.

CI=2.01, 2.50; n=338 deaths). For those who married after the introduction of HAART, the SMR was 1.33 (95% CI=1.04, 1.68; n=70 deaths) and only significantly elevated above unity 1 to 3 years after marriage. Corresponding EDRs declined dramatically from 9.63 excess deaths per 1000 person-years among men who married their same-sex partner between 1989 and 1995 to 1.53 excess deaths per 1000 person-years among those who did so between 1996 and 2004.

DISCUSSION

Strengths and Limitations

To the best of our knowledge this is the first population-based assessment of mortality in a demographically defined, complete group of gay and lesbian persons. Despite dramatic reductions in AIDS-associated mortality over the past decade, our study shows that same-sex-married Danish men and women have overall mortality rates that are currently 33% to 34% higher than those of the general population. Among women, the increased mortality was limited to the first 1 to 3 years of marriage, which is likely explained by deaths caused by severe diseases that were already present at the time of their marriage. Among men who married their partner during recent years when HAART was available to reduce the impact of AIDS deaths, SMRs were greater than 1.00 up to 6 years after the marriage, although only significantly so in the first 1 to 3 years. Since the introduction of HAART in 1996, AIDS-related deaths have contributed successively less to

overall mortality among gay men, the population at highest risk of HIV/AIDS in Denmark.⁹ Accordingly, among the men in our study, we observed a drastic reduction from 9.63 excess deaths per 1000 person-years among those who married their partner in the pre-HAART period to 1.53 excess deaths per 1000 person-years for those who married during the HAART period.

Mortality in industrialized countries like Denmark is largely determined by deaths from cardiovascular diseases and cancers. We are aware of no studies on the burden of cardiovascular diseases among gay and lesbian persons, but a previous study reported no evidence to suggest major differences in cancer morbidity between same-sex married persons and the general Danish population.¹⁰ Causes other than cancer deaths are therefore likely to account for the observed excess mortality in our cohort of same-sex marrying persons.

As with heterosexual couples, same-sex couples' decisions to marry rather than to stay together, unmarried, are determined by a variety of factors that, apart from romantic, emotional, sexual, moral, and religious arguments, may include financial, children-related, or other practical factors. The significant excess mortality in the first 1 to 3 years of same-sex marriage among women and men who married their partner after the introduction of HAART is likely, at least in part, to reflect preexisting severe illness. Some same-sex couples may have decided to marry to ensure that the surviving partner would have housing, inheritance, pension, and other financial advantages that would not otherwise be available to them.

Official estimates of the proportion of Danes who are gay or lesbian do not exist, so we cannot know how representative persons in same-sex marriages are of all gay and lesbian persons in Denmark. In a previous study, people in same-sex marriages were estimated to constitute somewhere between 1% and 6% of all gay or lesbian persons in Denmark.¹⁰ Our mortality findings are not necessarily representative of all Danish gay men or lesbians. Although our findings are likely to apply to other same-sex-partnered persons who live in steady relationships without formal registration,¹¹ it is more questionable to what extent our findings will also apply to unmarried gay or lesbian persons with continuously shifting partners, those who have both male and female partners, and those self-identified gay men and lesbians who do not have a partner at all. Lifestyles may differ considerably between subgroups, and it is likely that some subgroups have lower mortality rates than do others, depending on individual risk-taking behaviors, such as smoking, alcohol consumption, recreational drug use, and casual sexual relations.

Because same-sex marriage is a rather new institution, there is no empirical evidence available to suggest major systematic differences in known determinants of mortality between same-sex married persons and other gay or lesbian persons. In other settings in which homosexuality is not broadly accepted, same-sex marriage might serve as an indicator of "outness" that could be associated with other risk-taking behaviors. The situation is likely to be different in Denmark, which is more liberal on individual sexual rights than some other

countries. It is plausible that men and women in same-sex marriages may have systematically fewer exposures to known health hazards than do other gay men and lesbians, a situation parallel to that of married versus unmarried heterosexuals.^{12,13} If this is true, our current findings should raise cautious concern over what may be potentially higher mortality rates among the majority of gay and lesbian persons who do not opt for same-sex marriage.

The available literature contained no population-based data on mortality among gay and lesbian persons free of sexually transmitted infections. We had therefore anticipated that, at the group level, gay men might have somewhat higher mortality than do heterosexual men, because of the impact of AIDS deaths, notably before the introduction of HAART in 1996. Additionally, suicides and accidents—which according to some studies may be more common among gay men and lesbians than among heterosexuals^{14–16}—lifestyles that include higher levels of tobacco and alcohol consumption^{17–21} and, among women, overweight^{17,21,22} would further contribute to the expected higher mortality among gay men and lesbians. Our findings are compatible with these expectations, but additional study is required to identify the underlying specific causes of death contributing to the observed excess mortality overall.

Flawed Claims of Major Excess Mortality

Authors from the Family Research Institute, a US-based institution fighting to “restore a world . . . where homosexuality is not taught and accepted, but instead is discouraged and rejected at every level,”²³ have produced a series of reports^{24–27} in which they claim homosexuality is incompatible with full health²⁵ and as dangerous to public health as drug abuse, prostitution, and smoking.²⁷ In a recent report, the authors obtained data from Statistics Denmark and Statistics Norway and compared the average age at death among men and women who had ever been in a same-sex marriage with the average age at death among people who had ever been heterosexually married.⁶ Because the age distribution among persons in same-sex marriages was considerably younger than that of people who had ever been heterosexually married, the average age at death among those who actually died during the observation period was, not surprisingly,

considerably younger in the population of same-sex married persons. The Family Research Institute presented the lower mean age at death (by 22–25 years) for persons in same-sex versus heterosexual marriages as evidence that persons who married heterosexually “outlived gays and lesbians by more than 20 years on average.”^{6(p13)} Elementary textbooks in epidemiology warn against such undue comparisons between group averages because they lead to seemingly common-sense yet seriously flawed conclusions.²⁸

Constructive Concern Required

Conventional statistical analysis of Danish data provides a much less dramatic picture than the one drawn by the Family Research Institute. Nevertheless, our observations deserve careful consideration and constructive concern. We have documented the existence of moderately increased mortality among same-sex married Danish gay men and lesbians during the first few years of their marriages, even in recent years when AIDS deaths have declined markedly among gay men.⁹ By excluding the first year of marriage from our mortality calculations, we aimed to avoid serious overestimation of mortality because of preexisting illnesses at the time of marriage. However, our mortality rates may still be too high in the first 1 to 3 years because of chronic diseases with slow progression to death. Our findings are compatible with such an extended period during which preexisting illnesses may have inflated the mortality rates. Reassuringly, there was no significant excess mortality 4 or more years after same-sex marriage for women or men who married during the HAART period. As the cohort grows and matures, we hope to get a clearer picture of mortality differences between persons in same-sex marriages and other persons in Denmark.

Future Directions

To our knowledge, we have presented the first population-based assessment of mortality in a demographically defined, complete group of gay and lesbian persons. Our results showed markedly increased SMRs among same-sex married men in the pre-HAART era, when AIDS deaths contributed importantly to high mortality among Danish gay men. Since the introduction of HAART in 1996, this pattern

has changed dramatically, but overall mortality remains elevated in the first few years after entry into same-sex marriage. Similarly, mortality rates among women in the first few years of a same-sex marriage are about 34% higher than those of other women in Denmark. Although preexisting illness provides a plausible explanation for the excess mortality in the first years of same-sex marriage, additional follow-up of the cohort is required to provide estimates of long-term mortality, and studies of underlying cause-specific mortality are clearly warranted to identify the causes of death that prevail among gay and lesbian persons. Finally, studies in other settings are warranted to judge how generalizable our findings are to other groups of gay men and lesbians and to those in other countries. It may very well be that differentials in mortality between homosexual and heterosexual persons are more pronounced in other countries in which gay and lesbian persons are subject to stigmatization, indirect or overt discrimination, or even criminal prosecution. ■

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Contributors

M. Frisch originated and designed the study and drafted the article. H. Brønnum-Hansen conducted the statistical analyses and helped revise the article.

Human Participant Protection

This register-based study was approved by the Danish Data Protection Board (approval no. 2003-41-3329).

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