of high-dose VACs might result in broad-based interventions to address vitamin A deficiency (by increasing frequent low-level vitamin A intakes) together with continued targeted use of high-dose VACs for those who would benefit. However, we would again like to stress that, since VACs are distributed to 1–5-year-old children, they are not relevant to the majority of under 5-year-old deaths (USMR), which are predominantly in the first few months of life. At most, in some contexts, they might reduce overall USMR by about 5%. These considerations suggest that there should be higher priorities for use of large-scale programme resources aimed at reducing under-5 child mortality—by all means in contrast to research resources, which are clearly needed.

Mortality rates for same-sex married individuals compared with opposite-sex married individuals: potential analytical problems

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In 2013, Morten Frisch and Jacob Simonsen published the article ‘Marriage, cohabitation and mortality in Denmark: national cohort study of 6.5 million persons followed for up to three decades (1982–2011)’ in your journal.1

Frisch and Simonsen presented an impressive study with data from a national cohort of 6.5 million Danes with 122.5 million person-years of observations during 1982–2011. They set out to explore associations between living arrangements and mortality. By comparing same-sex married persons with opposite-sex married persons, however, an apparent association between sexual orientation and mortality became a significant theme of their article. The authors developed a design where they apparently transcended inherent methodological challenges related to epidemiological studies on marginalized groups by using population-based register data.2 With reasonably robust indications of sexual orientation (registered partnership/marriage), their work invites generalizations to the target group (the gay and lesbian population).

Analysing overall mortality and cause-specific deaths for the period 2000–11, Frisch and Simonsen concluded that mortality was increased among same-sex married women compared with opposite-sex married women in Denmark [hazard ratio (HR) 1.89], notably from suicide (HR 6.40) and cancer (HR 1.62).1 Finding these results alarming, we reviewed the approach of the article. In this letter we shall address potential analytical problems that may call for caution in the interpretation of their findings.

The authors wrote about categories for analysis: ‘Between 1 January 1982 and 30 September 1989, there were four marital status categories: (i) unmarried (never married), (ii) married, (iii) divorced or (iv) widowed. Since 1 October 1989, three additional categories appeared, namely homosexually married, divorced or widowed, following the implementation of the world’s first national law on registered same-sex partnerships; to gain statistical power we combined these categories in (v) current or former same-sex marriage.’ A corresponding combination was apparently not established for the comparison groups of opposite-sex married men and women. The HRs, including the period 2000–11, were hence calculated from categories which were not comparable. It is well known that mortality is higher in unmarried, divorced and widowed than in married people. When including data from divorced and widowed previously same-sex married individuals, the main outcome measure (mortality) is biased. One might argue that the impact of this bias is limited, due to the low numbers of divorced and widowed previously same-sex married individuals. However, a comparable pooling for opposite-sex married individuals...
in the analysis could yet have been performed to assure the reader that the presented comparisons were sound.

Furthermore, Figures 2 and 3 display gradients in the estimated hazard ratios by marital status. Given the low number of observed deaths in some of these categories (e.g. 187 deaths among women in present or previous same-sex marriage), and thereby limited statistical power, this is to be expected. Nevertheless, the hazard ratios are presented with quite narrow confidence intervals (Table 2). Is it possible that there is some kind of statistical dependency in the dataset that is not accounted for in the analysis? Many factors come into play in a dataset like this. In particular, we have not been able to locate information explaining how correlations between same-sex married individuals were accounted for. Every same-sex married individual has a close connection with at least one other individual in the same category, contributing correlations between pairs of observations. A similar problem does not occur for opposite-sex married individuals, since men and women are analysed separately.

Frisch and Simonsen have approached important health concerns, addressing how living arrangements were linked with overall cause-specific mortality, and they present alarming conclusions. This includes increased mortality rates for same-sex married individuals compared with opposite-sex married individuals. We would be eager to see results of an analysis that takes into account the methodological issues that we have raised.

References


Authors’ response to: Mortality rates for same-sex married individuals compared with opposite-sex married individuals

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We appreciate the thoughtful comments by Malterud et al. In the published paper,¹ numbers of deaths, particularly for some of the cause-specific deaths, were low in same-sex divorced or widowed persons. For power reasons, we therefore combined categories of currently and formerly same-sex married persons while keeping heterosexually married, divorced and widowed persons as separate categories.

Keeping this composition of the compared groups in mind, the published hazard ratios (HRs) provide valid estimates of the relative mortality in ever same-sex married vs currently opposite-sex married individuals. However, our HRs should not be incautiously interpreted as HRs for death associated with homosexuality per se. In addition to the uneven marital status composition of the compared categories, it should be recalled that there may well be other important differences with an impact on mortality between men and women who are, or were previously, in a same-sex marriage and the considerably larger groups of homosexual persons who never married a same-sex partner.

Supplementary analysis: HRs of death among subgroups of ever same-sex married persons

Malterud et al. plausibly point out that the increased mortality seen in divorced and widowed compared with currently married individuals among heterosexual persons might also be seen when comparing divorced and widowed with currently same-sex married homosexual persons. To address this, we repeated the Cox proportional hazards regression analysis of our original article¹ to recalculate the HRs for overall mortality in our article’s Table 2 and the HRs for cause-specific mortality in Table 4, this time keeping same-sex married, divorced and widowed persons in separate categories.