

- Paper

Sex and death: are they related? Findings from the Caerphilly cohort study

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Abstract

Objective: To examine the relation between frequency of orgasm and mortality.

Study design: Cohort study with a 10 year follow up.

Setting: The town of Caerphilly, South Wales, and five adjacent villages.

Subjects: 918 men aged 45–59 at time of recruitment between 1979 and 1983.

Main outcome measures: All deaths and deaths from coronary heart disease.

Result: Mortality risk was 50% lower in the group with high orgasmic frequency than in the group with low orgasmic frequency, with evidence of a dose-response relation across the groups. Age adjusted odds ratio for all cause mortality was 2.0 for the group with low frequency of orgasm (95% confidence interval 1.1 to 3.5, test for trend $P=0.02$). With adjustment for risk factors this became 1.9 (1.0 to 3.4, test for trend $P=0.04$). Death from coronary heart disease and from other causes showed similar associations with frequency of orgasm, although the gradient was most marked for deaths from coronary heart disease. Analysed in terms of actual frequency of orgasm, the odds ratio for total mortality associated with an increase in 100 orgasms per year was 0.64 (0.44 to 0.95).

Conclusion: Sexual activity seems to have a protective effect on men's health.

Key messages

- Sex and death are common variables in epidemiology, but the relation between them has been little studied
- In this cohort study, mortality risk was 50% lower in men with high frequency of orgasm than in men with low frequency of orgasm; there was evidence of a dose-response relation across the groups
- The question of causation is complex, as with all observational epidemiological findings; several explanations are possible, but the evidence for causation is as convincing here as in many areas where causation is assumed
- These findings contrast with the view common to many cultures that the pleasure of sexual intercourse may be secured at the cost of vigour and wellbeing

- If these findings are replicated, there are implications for health promotion programmes

Introduction

Even for a group not especially known for humour, the epidemiologist's standard joke about “being broken down by age and sex” is rather tired. It is also conceptually colourless, for the non-epidemiologist takes more interest in sex as an activity than as a stratification variable. Sexual behaviour as an exposure has been little investigated, outside its capacity for transmitting communicable disease. Few data exist on the association between patterns of sexual behaviour and later mortality, despite sex and death—the joint obsessions of adolescence^{1 2}—being frequently linked in youthful interpretations of the human condition.^{3 4 5 6} One barrier to the study of frequency of sexual intercourse as an exposure may be that observational epidemiology tends to be conducted on middle aged and ageing populations by middle aged or ageing researchers. The fading imaginations of researchers—assumed to be shared by their subjects—renders the whole area apparently uninteresting. This is an instance of a more general phenomenon of epidemiologists studying what interests other epidemiologists, and not always being drawn to areas of more general public concern. There may be more exciting issues for the public than determining exactly how many servings of fruit and vegetables a day may confer enhanced health, or discovering that smoking is even worse for people than was once thought.



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Once the action moved into the bedchamber, a cry of “I die, I die!” signalled the desired outcome

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A few exceptions to the general epidemiological silence on the association between sexual behaviour and later mortality exist. In the Duke first longitudinal study of ageing, frequency of sexual intercourse was inversely associated with mortality in men, and enjoyment of intercourse was inversely related to mortality among women.⁷ This finding is compatible with a perception that the quantity of sexual activity is of more importance to men, while a greater concern with quality is seen among women.^{8 9} In a Swedish study early cessation of sexual intercourse was found to be associated with an increased mortality risk among men over a 5 year follow up.¹⁰ Sexual dissatisfaction was found to be a risk factor for myocardial infarction in a case-control study of women, with premature ejaculation and impotence in husbands being

the major underlying factor.¹¹ From a different perspective, the assumption that Catholic priests and nuns are celibate renders another epidemiological design relevant here. A retrospective cohort analysis involving 10 026 priests in the United States revealed a marginally increased overall standardised mortality ratio of 103 (95% confidence interval 100 to 106), though mortality for arteriosclerotic heart disease was more substantially raised (118, 113 to 122).¹² Interestingly, mortality for cirrhosis of the liver was greatly increased, with a standardised mortality ratio of 147 (122 to 173). A study of nuns found opposite findings, with lower overall mortality than in the general population.¹³ Low rates of smoking among the nuns was considered to be key in this case.

Unfortunately all of these studies have contained only limited data on potential confounding factors and could thus say little about whether the observed associations were causal. In view of the dearth of evidence on this question we have examined the association between sexual behaviour and mortality in a cohort of men for whom data on health related behaviours, existing coronary disease at baseline, social class, and physiological risk factors are available.

Participants and methods

The Caerphilly study is based upon a 100% sample of men selected from the town of Caerphilly and five adjacent villages. The men were chosen by date of birth so that they were aged 45–59 years when examined between 1979 and 1983. A total of 2512 men were seen—89% of the 2818 who were found to be eligible. At recruitment the men were invited to a clinic at which a standard medical history was obtained and a detailed questionnaire administered. At examination, height was measured with a Holtain stadiometer, blood pressure was measured, and a 12-lead electrocardiogram was recorded. Existing coronary heart disease at baseline was defined as either probable ischaemia detected by electrocardiogram or angina on the Rose questionnaire. The subjects were then asked to return, after an overnight fast, to an early morning clinic where a blood sample was taken with minimal venous stasis. Total cholesterol was assayed on these samples. Full details of the procedures used in the Caerphilly study have been reported previously.^{14,15}

Following a brief explanation of the purpose of the question, men at each clinic were asked about frequency of sexual intercourse by a medical interviewer. The responses were classified into categories ranging from never through to daily. These were reduced to three categories: less than monthly; twice a week or more; and an intermediate category. Recalled number of orgasms has been shown previously to offer a reliable measure of male sexual activity.¹⁶ The question was asked only in the first period of the survey; it was abandoned, after discussions with local general practitioners, because of a possible effect on the overall response rate. Responses were provided by 918 of the 1222 men who were interviewed before the question was removed from the questionnaire. Plasma testosterone and oestradiol were measured in the whole cohort of men; their predictive value for subsequent coronary heart disease has been reported elsewhere.¹⁷

The records of all men at the NHS central registry were flagged so that notification of death was automatic and a copy of the death certificate was received. Ten year follow up data for mortality are reported here. All death certificates were coded according to ICD-9 (international classification of diseases, ninth revision). Deaths due to coronary heart disease are those coded ICD 410-414.

Statistical methods

Age adjustment for risk factors was to the age structure of the population with usable data on frequency of orgasm. Multiple logistic regression was used to explore the effects of other risk factors on the association between mortality and frequency of orgasm. In these models age, systolic blood pressure, and cholesterol were entered as continuous variables, and social class (manual or non-manual), coronary heart disease at baseline, and smoking behaviour as categorical variables.

Results

Data regarding frequency of orgasm were available on 918 men (response rate 75%). Differences between the men for whom responses were and were not obtained during the period the question was asked were considerable; those who gave responses that could be coded were younger, taller, had less evidence of coronary heart disease at screening, and were more likely to be in non-manual occupations than the men who refused to, or could not, answer the question. The odds ratio for all cause mortality for the men from whom data on frequency of orgasm were not obtained compared to those from whom they were was 2.05 (1.51 to 2.78). Adjusting for age, coronary heart disease at baseline, social class, and height reduced this to 1.73 (1.24 to 2.39).

Characteristics of the respondents according to reported frequency of orgasm are presented in Table 1. The reported frequency decreased with age and was higher among men in non-manual occupations. No other risk factor was significantly related to frequency of orgasm, although the tendency was for blood pressure and cholesterol concentrations to be more favourable among those reporting lower frequency, whereas smoking history and prevalent coronary heart disease at baseline showed an opposite pattern. Over 10 years of follow up 150 of the respondents died: 67 from coronary heart disease and 83 from other causes. Age adjusted odds ratios for deaths from all causes, coronary heart disease, and other causes according to frequency of orgasm group are given in Table 2. Mortality risk in the group with high frequency of orgasm was less than half of that of the group with low frequency, with evidence of a dose-response relation across the groups. The patterns for deaths from all causes, coronary heart disease, and other causes were similar, although the gradient was steepest for deaths from coronary heart disease. Adjusting for social class, smoking, blood pressure, and coronary heart disease at baseline (and for cholesterol in the case of death from coronary heart disease) attenuated the associations to a relatively small degree (Table 2).

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Table 1

Characteristics of men (with standard error) in relation to frequency of orgasm

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Table 2

Odds ratios (95% confidence intervals) for mortality adjusted for age and risk factors

The association between frequency of orgasm and all cause mortality was also examined using the midpoint of each response category recoded as number of orgasms per year. The age adjusted odds ratio for an increase of 100 orgasms per year was 0.64 (0.44 to 0.95).

Discussion

Sex and death: is the association causal?

This study reveals an inverse relation between orgasmic frequency and mortality and is consistent with most,^{7 101112} but not all,¹³ previously published work. Before this finding can be considered as suggesting a causal relation, several aspects of the data must be considered.

Relevant data were available on 75% of the original sample examined before the question about frequency of orgasm was dropped from the study. The men with full data were younger, taller, had less coronary heart disease at baseline, were more likely to be in non-manual occupations, and had an overall lower mortality than those for whom frequency of orgasm was not known. The possibility of bias must therefore be considered, though there is no reason to suspect that the subset of men without full data included a disproportionate number with either a high frequency of orgasm and high mortality risk or a low frequency of orgasm and a low mortality risk. The relation between frequency of orgasm and mortality is clearly confounded by age and social class, and to a lesser extent by smoking habit and health status at baseline. The association between frequency of orgasm and mortality was, as expected, attenuated somewhat when these variables were entered into the models. Nevertheless a strong and statistically significant association remains in the adjusted models. Reverse causation must also be considered. Although this is likely to have strengthened the association found here, with early signs of later serious disease leading to a decreased frequency of orgasm, existing coronary heart disease at baseline was adjusted for. We found an inverse association between death from coronary heart disease and frequency of orgasm even though myocardial ischaemia and myocardial infarction can be triggered by sexual activity.^{18 19} Despite this, confounding may well account for our findings. Multivariable models are seriously limited in their ability to control for confounding, especially with covariates that are imprecisely measured.²⁰²¹ Furthermore, unmeasured or unknown confounders can create strong, apparently “independent,” associations between risk factors and mortality.²² However, the association between frequency of orgasm and mortality in the present study is at least—if not more—convincing on epidemiological and biological grounds than many of the associations reported in other studies²³²⁴²⁵ and deserves further investigation to the same extent. Intervention programmes could also be considered, perhaps based on the exciting “At least five a day” campaign aimed at increasing fruit and vegetable consumption²⁶—although the numerical imperative may have to be adjusted. The disappointing results observed in health promotion programmes in other domains²⁷ may not be seen when potentially pleasurable activities are promoted.

Sex and death in other times and other places

This epidemiological indifference to the question of whether patterns of sexual behaviour influence general wellbeing contrasts with wider interest in this issue. Longstanding expressions of such concerns are codified in ritual practices and religious texts. Within the Christian tradition Paul's assertion that “It is good for a man not to touch a woman”²⁸ is in continuity with one tradition of the Hellenistic world, where celibacy offered the opportunity to pursue philosophy and achieve virtue and wellbeing.²⁹ The view that the male pleasure of sexual intercourse is secured at the cost of vigour and wellbeing is common in a wide range of cultures. One of the extreme expressions of this idea is found among the Huli people of Papua New Guinea. Here young men were sent to secret bachelor houses hidden in the forest and taught by celibate specialists of the mortal dangers of succumbing to women's desires; if sexual contact had to occur at all, it should be restricted to the needs of procreation.³⁰ In North India any loss of semen is considered to be debilitating, leading to skin problems, lack of concentration, anxiety, painful joints, palpitations, headaches, pains in the chest, swollen gums, and halitosis.³¹ The biological mechanism considered to be involved is that the production of one tablespoon of semen requires 40 kilograms of food. The entropic idea that sexual restraint retains vigour also has a strong scientific tradition. This reached its most forceful expression in the work of Eugen Steinach, who became “Professor Extraordinarius” in Prague in 1895, before returning to Vienna as professor of physiology.³² The key outcome of his work in this context was the acceptance in surgical practice of the view that ligation of the vas deferens led to rejuvenating increases in the output of male sex hormones. Surgery thus produced a physiological form of celibacy that was compatible with, and was understood to stimulate, sexual performance. It is not surprising that

such a powerful, and for surgeons lucrative,³³ placebo became very popular in the days before evidence based surgery became the norm. Even some rather publicly unfavourable evidence did not dissuade hopeful and desperate old men in their search for “rejuvenation.” A celebrated case was a certain Mr Wilson, one of Steinach's own patients, who died on the day before he was to have delivered a public lecture at the Albert Hall entitled “How I was made twenty years younger.”³⁴ One of the most famous recipients of the Steinach operation was W B Yeats. Stephen Lock's account of this suggested that, at least in Yeats' case, the operation was highly successful.³⁵ Indeed, Yeats became known to Dubliners as “the gland old man.” Contradictory notions of how sexual activity should be related to health exist in the popular domain. Our finding that sexual activity may be protective of middle aged men's health contrasts with some of the strictures dominant in a wide range of current and historical cultures. What may be regarded as good for societies may be bad for individuals. For example, it seems that the changes in living conditions that followed the first agricultural revolution disadvantaged the new farmers and resulted in deteriorating nutrition, however much it advantaged their rulers.³⁶ Sexual behaviour and social structures are closely intertwined. We do not know whether the public position promoting relative continence accords with people's actual views in this or other societies, and as far as we are aware this question has not been researched. In an earlier study that examined public ideas about the prevention of coronary heart disease we described a lay epidemiology that is in some ways closer to the true epidemiology of risk than to the strictures that are disseminated through health education.^{37 38} It remains for other epidemiologists to offer supportive or contrasting findings on the issue considered here, though the likely absence of randomised controlled trial data will make the matter difficult to resolve. If these findings are replicated and confirm that sexual activity is indeed protective for middle aged men, it is for anthropologists to judge whether the lay epidemiology supports the true epidemiology. It would be interesting to know whether people are privately convinced that the conventional case for relative abstinence is in their own interest as well as that of an ordered society.

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References

1. [1.](#)
1. Joyce J
A portrait of the artist as a young man. London: Cape,1956.
2. [2.](#)
1. Cohen L
The favourite game. London: Secker and Warburg,1963.
3. [3.](#)
1. SCUM Auxiliary
Con/text 119. On: Obscure independent classics, vol 6.Ipswich: Hamster Records, 1983.
4. [4.](#)

1. Easton Ellis B
. *American psycho*. New York: Simon and Schuster, 1988.
5. 5. [↵](#)
1. Acker K
. *Blood and guts in high school*. New York: Random House, 1984.
6. 6. [↵](#)
1. Purdy J
. *Color of darkness*. New York: Random House, 1961.
7. 7. [↵](#)
1. Palrnore EB
. Predictors of the longevity difference: a 25-year follow-up. *Gerontologist* 1982;6: 513–8.
8. 8. [↵](#)
1. Solanas V
. *SCUM manifesto*. London: Olympia Press: Pans, 1971.
9. 9. [↵](#)
1. Greer G
. *The female eunuch*. London: MacGibbon and Kee, 1968.
10. 10. [↵](#)
1. Persson G
. Five-year mortality in a 70-year old urban population in relation to psychiatric diagnosis, personality, sexuality and early parental death. *Acta Psychiatr Scand* 1981;64: 244–53.
11. 11. [↵](#)
1. Abramov LA
. Sexual life and frigidity among women developing acute myocardial infarction. *Psychosom Med* 1976;38: 418–25.
12. 12. [↵](#)
1. Kaplan SD
. Retrospective cohort mortality study of Roman Catholic priests. *Prev Med* 1988;17: 335–343.

13. 13. [↵](#)

1. Butler SM,
2. Snowdon DA
.Trends in mortality in older women: findings from the nun study. *J Gerontol Ser B* 1996;51: S201–8.

14. 14. [↵](#)

1. Caerphilly and Speedwell Collaborative Group
.Caerphilly and Speedwell Collaborative heart disease studies. *J Epidemiol Community Health* 1984;38: 259–62.

15. 15. [↵](#)

1. Yarnell JWG,
2. Sweetnam PM,
3. Marks V,
4. Teale JD,
5. Bolton CH
.Insulin in ischaemic heart disease: are associations explained by triglyceride concentrations? The Caerphilly prospective study. *Br Heart J* 1994;71:293–6.

16. 16. [↵](#)

1. Davidson JM,
2. Chen JJ,
3. Crapo L,
4. Gray GD,
5. Greenleaf WJ,
6. Catania JA
.Hormonal changes and sexual function in aging men. *J Clin Endocrinol Metab* 1983;57: 71–7.

17. 17. [↵](#)

1. Yarnell JWG,
2. Beswick AD,
3. Sweetnam PM,
4. Riad-Fahny D
.Endogenous sex hormones and ischaemic heart disease in men. The Caerphilly prospective study. *Arteriosclerosis Thromb* 1993;13: 517–20.

18. 18. [↵](#)

1. Drory Y,
2. Shapira I,

3. Isman EZ,
4. Pines A
.Myocardial ischaemia during sexual activity in patients with coronary artery disease.Am J Cardiol1995;75: 835–7.

[\[CrossRef\]](#)[\[Medline\]](#)[\[Web of Science\]](#)

19. [19.](#)

1. Muller JE,
2. Mittleman MA,
3. Maclure M,
4. Sherwood JB,
5. Tofler GH
.Triggering of myocardial infarction by sexual activity.JAMA 1996;275: 1405–9.
[\[Abstract/FREE Full text\]](#)

20. [20.](#)

1. Phillips AN,
2. Davey Smith G
.How independent are independent effects? Relative risk estimation when correlated exposures are measured imprecisely.J Clin Epidemiol 1991;44: 1223–31.

21. [21.](#)

1. Davey Smith G,
2. Phillips AN
.Confounding in epidemiological studies: why “independent” effects may not be all they seem.BMJ 1992;305: 757–9.

22. [22.](#)

1. Davey Smith G,
2. Phillips AN,
3. Neaton JD
.Smoking as “independent” risk factor for suicide: illustration of an artefact from observational epidemiology.Lancet 1992;340: 709–12.

23. [23.](#)

1. Knekt P,
2. Järvinen R,
3. Reunanen A,
4. Maatela J
.Flavanoid intake and coronary mortality in Finland: a cohort study.BMJ 1996;312: 478–81

[\[Abstract/FREE Full text\]](#)

24.24.↵

1. Nyysönen K,
2. Parviainen T,
3. Salonen R,
4. Uomilehto J,
5. Salonen JT

.Vitamin C intake and risk of myocardial infarction: prospective population study of men from eastern Finland.BMJ 1997;314: 6348.

25.25.↵

1. Whiteman MC,
2. Deary IJ,
3. Lee AJ,
4. Fowkes FG

.Submissiveness and protection from coronary heart disease in the general population: Edinburgh Artery Study.Lancet 1997;350: 541–5.

[\[CrossRef\]](#)[\[Medline\]](#)[\[Web of Science\]](#)

26.26.↵

1. Sharp I

, ed.*At least five a day: strategies to increase fruit and vegetable consumption*. London: Stationary Office,1997.

27.27.↵

1. Ebrahim S,
2. Davey Smith G

.Systematic review of randomised controlled trials of multiple risk factor interventions for preventing coronary heart disease.BMJ 1997;314: 1666–74.

[\[Abstract/FREE Full text\]](#)

28.28.↵

1. Bible Holy

.*I Corinthians vii*, 1. (King James Version.)

29.29.↵

1. Deming W

.*Paul on marriage and celibacy*. Cambridge: Cambridge University Press,1995.

30. 30. [↵](#)

1. Frankel S
. *The Huli response to illness*. Cambridge: Cambridge University Press, 1986.

31. 31. [↵](#)

1. Alter JS
. Seminal truth: a modern science of male celibacy in north India. *Med Anthropol Q* 1997;11: 275–98.

32. 32. [↵](#)

1. Schutte H,
2. Herman JR
. Eugen Steinach, 1861-1944. *Investigative Urology* 1975;12: 330–1.

33. 33. [↵](#)

1. Fraser I
. Steinach operation. *BMJ* 1984;288: 242.

34. 34. [↵](#)

1. Haire N
. *Rejuvenation*. London: George Allen and Unwin, 1924.

35. 35. [↵](#)

1. Lock S
. “O that I were young again”: Yeats and the Steinach operation. *BMJ* 1983;287: 1964–8.

36. 36. [↵](#)

1. Cohen KN,
2. Armelagos GJ
, eds. *Paleopathology at the origins of agriculture*. New York: Academic Press, 1984.

37. 37. [↵](#)

1. Frankel SJ,
2. Davison C,
3. Davey Smith G
. Lay epidemiology and the rationality of responses to health education. *Br J Gen Pract* 1991;41:428–30.

38. 38. [↵](#)

1. Davison C,
2. Davey Smith G,
3. Frankel SJ

.Lay epidemiology and the prevention paradox—the implications of coronary candidacy for health education. *Sociology of Health and Illness* 1991;13: 1–19