Impotence and its medical and psychosocial correlates: results of the Massachusetts Male Aging Study

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Trial conclusions
In the late 1980s, the Massachusetts Male Aging Study (MMAS) revealed that in a healthy New England population, 52% of men aged 40–70 had impotence to some degree. Age was the main associated variable, with complete impotence rising from 5% at 40 years to 15% at 70 years. However, multiple, additional correlates were identified, including chronic diseases and potentially modifiable para-aging phenomena such as cardiovascular risk factors.

Background and aims
Ten years ago, in 1992, a National Institutes of Health (NIH) consensus statement on impotence declared that “appalling little is known about the prevalence of erectile dysfunction in the United States”. Two years later, the MMAS was published and was clearly the landmark study of the epidemiology of impotence. Its aim was to determine the prevalence of impotence and its association with age and other important covariates.

Study design
The MMAS was undertaken as a random sample, population-based, cross-sectional observational study of 1,709 healthy men age 40–70 years to assess the impact of aging on a wide range of health variables. Subjects were visited at home where they completed questionnaires and had clinical measurements and blood samples taken. However, while the original data collection included nine questions on sexual activity, it did not include the self-assessed global measure of impotence, called for by the NIH consensus statement. The investigators therefore conducted an additional study in a clinic-derived sample of 303 patients in which participants answered a question on their perceived degree of impotence in addition to the sexual function questions from the original study. A surrogate variable could then be constructed with four categories ranging from no erectile difficulty to complete impotence which could be calculated from the original data and used as the principal outcome variable of the study. In addition to age, other correlates examined included anthropomorphic data, clinical history, medications, psychological traits and measurement of blood lipids and sex hormones.

Results
Respondents were representative of the ethnic mix (95% white) in Massachusetts at the time. They were overweight (BMI 27.5 kg/m²), 22% were smokers and significant proportions had diabetes (7%), heart disease (12%) and hypertension (30%). Fifty-two percent of respondents reported some degree of impotence (17% mild, 25% moderate and 10% complete). The prevalence of moderate impotence doubled from 17 to 34% and complete impotence tripled from 5 to 15% between the ages of 40 and 70 (figure 1). Other associations were reported...
after adjustment for age. Chronic medical conditions that were significantly associated with complete impotence included hypertension (doubling), diabetes (tripling), treated heart disease (quadrupling). Smoking doubled the prevalence of impotence in these conditions (table 1), but no relationship was found with obesity or alcohol consumption. Other correlates included lower plasma high density lipoprotein (HDL) cholesterol, dehydroepiandrosterone-sulphate (DHEA-S) and dihydrotestosterone, but not other androgens or oestrogens. Significant psychological covariates included anger, depression, and a less dominant personality.

Commentary
Prior to the publication of this paper, only very limited data were available on the prevalence and correlates of impotence in the general population. The study allowed the estimation of the importance of impotence as a health issue on a national and even a global scale.

Paradoxically, the fact that the MMAS was not initially designed as a study of impotence contributed to its strength. Though it was designed to address a wide range of health interests in aging males, it turned out to be the study that the NIH Consensus Conference was calling for in 1992. The prompt construction of the surrogate measure made it the definitive study of the epidemiology of impotence.

The validity of a single measure of impotence can be debated. Even the more focused concept of erectile dysfunction is a highly complex and many dimensional condition. The subjective nature of the NIH consensus definition is likely to be influenced over time by changing social contexts and sexual mores. On the other hand, a purely objective measure of erectile strength and frequency has little meaning in the context of the complexity of human sexual relationships, and the self-assessed surrogate variable correlated well with most of the specific sexual function questions contained in the original questionnaire. More recent comparisons with clinical questionnaires such as the International Index of Erectile Function (IIEF) and the Brief Male Sexual Function Inventory (BMSFI) show good correlations, similar estimates of prevalence and moderate agreement.

It emphasised the strength of the relationship with increasing age but, in addition, the breadth and detail of the correlates it identified raised important questions of aetiology, including whether the increase in prevalence with age could be partly preventable. However, this is thrown into doubt by the positive association that was found with chronic drug therapy (though it is impossible to differentiate this from the effects of the diseases themselves). The psychological correlates of impotence were of interest, including associations with character traits (dominance/passivity), which might represent underlying susceptibility, and with emotional states such as anger and depression, where causes and effects are hard to disentangle.

Nine years after the original study, a follow-up study took place: 1,156 of the participants (77% of the survivors of the original cohort) were re-interviewed, providing incidence data to supplement the original prevalence findings. The overall incidence of moderate or complete erectile dysfunction in this survivor population was approximately 26% new cases per 10 person years, and was positively associated with age, heart disease, diabetes, treated hypertension and lower education at baseline.

In addition to the incidence data, the follow-up study included the global self-assessed measure of impotence that was absent in the original questionnaire. This allowed the derivation of a new surrogate measure that could be applied retrospectively to the original data and had important advantages, being derived from within the study cohort, better able to handle missing data and yielding more valid results, e.g. reclassifying some individuals in a more sensible way than had the original construct. The use of this second surrogate measure yielded even stronger associations with
age and smoking while maintaining consistent associations with heart disease, hypertension and diabetes.

The main strength of this paper, reporting the prevalence and medical and psychosocial correlates of impotence in the MMAS, arises from the fact that the study itself was designed as a wide ranging investigation into the health of an aging population, allowing an impressive breadth of correlates to be investigated. The application of a retrospective, global, self-reported measure of impotence to this data gave it enormous contemporary relevance when it was published, and continues to provide the benchmark for all future studies in the field.

References

Key messages
- Self reported impotence to some degree affected 52% of 40–70-year-old men
- Prevalence increased with age, complete impotence rising from 5–15% between 40–70 years
- Impotence was strongly associated with treated heart disease (quadrupling), diabetes (tripling) and smoking (doubling prevalence in association with chronic disease)
- Impotence correlated with increasing expression or suppression of anger and with increasing depression