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# Urinary, bowel and sexual health in older men from Northern Ireland

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## Objectives

To provide data on the prevalence of urinary, bowel and sexual dysfunction in Northern Ireland (NI), to act as a baseline for studies of prostate cancer outcomes and to aid service provision within the general population.

## Subjects and Methods

A cross-sectional postal survey of 10 000 men aged ≥40 years in NI was conducted and age-matched to the distribution of men living with prostate cancer. The EuroQoL five Dimensions five Levels (EQ-5D-5L) and 26-item Expanded Prostate Cancer Composite (EPIC-26) instruments were used to enable comparisons with prostate cancer outcome studies. Whilst representative of the prostate cancer survivor population, the age-distribution of the sample differs from the general population, thus data were generalised to the NI population by excluding those aged 40–59 years and applying survey weights. Results are presented as proportions reporting problems along with mean composite scores, with differences by respondent characteristics assessed using chi-squared tests, analysis of variance, and multivariable log-linear regression.

## Results

Amongst men aged ≥60 years, 32.8% reported sexual dysfunction, 9.3% urinary dysfunction, and 6.5% bowel dysfunction. In all, 38.1% reported at least one problem and 2.1% all three. Worse outcome was associated with increasing number of long-term conditions, low physical activity, and higher body mass index (BMI). Urinary incontinence, urinary irritation/obstruction, and sexual dysfunction increased with age; whilst urinary incontinence, bowel, and sexual dysfunction were more common among the unemployed.

## Conclusion

These data provide an insight into sensitive issues seldom reported by elderly men, which result in poor general health, but could be addressed given adequate service provision. The relationship between these problems, raised BMI and low physical activity offers the prospect of additional health gain by addressing public health issues such as obesity. The results provide essential contemporary population data against which outcomes for those living with prostate cancer can be compared. They will facilitate greater understanding of the true impact of specific treatments such as surgical interventions, pelvic radiation or androgen-deprivation therapy.

## Keywords

urinary dysfunction, bowel dysfunction, sexual dysfunction, health-related quality of life, prostate cancer, Life After Prostate Cancer Diagnosis

## Introduction

The prevalence of prostate cancer has increased dramatically since the early 1990s [1,2]. Coupled with this there has been an increase in studies of patient-reported outcomes and initiatives to support the morbidity burden associated with prostate cancer diagnosis and its treatment [3]. However, the vast majority of studies do not have large matched control data or comparable general population data. Consequently, such studies may be overestimating the negative consequences of treatment.

Various surveys of urinary, bowel, and sexual symptoms in the general populations of the USA and Europe [4–14] have found these problems to be common amongst elderly men, with LUTS ranging from 48% to 72% [4–6], moderate-to-severe urinary incontinence from 11% to 16% [5–8], severe/frequent erectile dysfunction from 5% to 10% [4,9–11], and faecal incontinence from 6% to 15% [12–14].

However, comparing the results from these general population studies with those for current prostate cancer survivors to assess the additional impact of prostate cancer and its treatment is not straightforward. Not only are most of these studies dated, they are not specific to a particular population (e.g. they rarely report Northern Ireland [NI]/UK specific results). In addition, they typically use survey instruments not directly comparable with those used in assessments of prostate cancer outcomes, whilst the age structure of men surveyed in general population surveys rarely match those of prostate cancer survivors as more than half (54% in 2012–2014) of prostate cancer cases diagnosed in the UK are amongst males aged ≥70 years [2].

The measurement of problems of this nature is also relevant to the health of men who do not have prostate cancer. However, with significant gains in life expectancy in recent years [15], changes in lifestyle factors (such as rising obesity levels) [16], and changes in prevalence of common health conditions (e.g. reductions in hypertension, increases in diabetes) [16], contemporary older men are likely to have different health outcomes than the more historical cohorts documented by previous studies. Consequently, there is a need to update population observations of these problems to allow differentiation between the impact of prostate cancer and its treatment from the normal effects of ageing, and to provide health service planners with information on the prevalence of these conditions in the general population to ensure that the necessary support services are in place.

We report a comprehensive evaluation of self-reported urinary, bowel, and sexual dysfunction, alongside health-related quality of life (HRQL) and self-assessed health rating, in a population of men aged ≥40 years in NI, a devolved nation of the UK. We utilise a sample that has been age-matched to the prostate cancer survivor population and use survey instruments widely applied in the evaluation of prostate cancer outcomes. In addition, we generalise these data to the NI population for men aged ≥60 years to provide information necessary for public health purposes, including reporting prevalence of urinary, bowel, and sexual dysfunction; and report how sociodemographic characteristics, health-related factors, and general health are associated with these conditions.

## Subjects and Methods

### Background

A cross-sectional postal survey of the general NI population was conducted as part of the Life After Prostate Cancer Diagnosis (LAPCD) study [17]. Additional surveys involved prostate cancer survivors, the results of which will be reported elsewhere.

### Data Collection

An age-stratified random sample of 10 000 men aged ≥40 years was prepared by the Health and Social Care Business Services Organisation (BSO) using the NI General Practice Register. To allow comparability with the prostate cancer survivor survey, the sampling frame was based on the age distribution of prostate cancer survivors in NI who were alive 18–42 months after diagnosis. Men identified by the NI Cancer Registry as having a previous prostate cancer diagnosis were excluded.

Each member of the sample had a unique reference number assigned, thereby protecting the identity of participants. BSO posted surveys throughout September and October 2016, with instructions to return completed surveys to an external provider (Picker Institute Europe, Oxford, UK). On completion of data entry, deprivation quintile, based on the NI multiple deprivation measure [18], and an urban/rural indicator, based upon the NI statistical classification of settlements [19], was added.

### Survey

The survey (File S1) was adapted from the LAPCD survey of prostate cancer survivors and included a wide range of respondent characteristics. HRQL was evaluated using the EuroQoL five Dimensions five Levels (EQ-5D-5L) instrument, which included a self-assessed health rating [20]. Urinary, bowel, and sexual health were determined using the 26-item Expanded Prostate Cancer Composite (EPIC-26) questionnaire [21], in line with recommendations from the International Consortium for Health Outcomes Measurement (ICHOM) [22,23]. Adaptations to the survey for the general population included removing references to cancer and its treatment in the supporting text such as the introduction and

completion guidance; however, changes to the actual questions asked were minimal.

Service users participated in the study design and development of the questionnaire through the User Advisory Group for the LAPCD study. Cognitive testing for user acceptability in terms of length, content and clarity of survey questions was performed with a focus group of older men from the general population accessed through a local ageing charity.

## Outcome Measures

Reported prevalence of men experiencing problems was based upon the proportion of men reporting moderate/big problems in response to specific questions from the EPIC-26 question set (urinary: q2.6, bowel: q2.8, sexual: q2.13; File S1). The individual EQ-5D-5L questions on mobility, self-care, usual activities, pain/discomfort, and anxiety/depression (q1.1–q1.5) were coded to 'No problems' and 'With problems'.

Summary scores for each EPIC-26 domain were calculated by averaging standardised scores assigned to each question's responses in that domain (urinary incontinence: q2.2–q2.5a, urinary irritation/obstruction: q2.5b–q2.5f, bowel function: q2.7a–q2.8, sexual function: q2.9a–q2.13; File S1). For each domain the possible range of scores is 0–100, with 100 corresponding to no problems. The self-assessed health rating (q1.6 – EuroQoL visual analogue scale [EQ-VAS]) was used as a summary score of general health, with a higher score representing better general health.

## Exclusions, Weighting and Missing Data

The sample was designed to match the age structure of prostate cancer survivors thereby allowing comparability of outcomes from this cohort with prostate cancer studies. Rates of prostate cancer increase with age [1], thus the proportion of respondents to the survey aged 40–49 years is lower compared to older ages (12.1% aged 40–59, 45.0% aged 60–69, 42.9% aged ≥75 years) (Table 1). As planned this is similar to the age distribution of prostate cancer survivors; however, it is not representative of the general NI population where 59.6% of men aged ≥40 years are aged 40–59 years [24]. For the purposes of making comparisons with prostate cancer survivors no further adjustments are required. When utilising these data to report on the general NI population, weights by age and deprivation need to be applied so that the sample distribution matches that of the NI population. The weights required to increase the representativeness of the men aged 40–59 years from 12.1% to 59.6% would be large and need to be applied to a small number of respondents (358 men) resulting in less robust results. Thus, respondents aged 40–59 years were excluded prior to the calculation and application of survey weights, with analysis for the general population conducted for those aged ≥60 years only.

Missing data were dealt with on a question-by-question basis; men with missing responses were excluded from the analysis, thus all proportions and mean values refer to the men who responded to that question.

## Statistical Analysis

Pairs of proportions were compared using $Z$-tests, whilst chi-squared tests were used to compare the distribution of responses across all categories in a variable. Weighted means (with standard deviation, median and interquartile range are included as supplementary data) are reported for continuous data such as the summary EPIC-26 domains and self-assessed health rating, with ANOVA used to compare distributions. The Bonferroni correction was applied to compensate for multiple comparisons in all scenarios.

**Table 1** Response rates and characteristics of survey respondents.

| | Study response rate, % | Respondents*, n or % | | | NI population†, n or % | | Survey data generalised to NI population‡, n (%) |
|---|---|---|---|---|---|---|---|
| | | N | Age ≥40 years | Age ≥60 years | Age ≥40 years | Age ≥60 years | |
| **Total** | 29.6 | 2955 | 2955 | 2597 | 397 977 | 160 818 | 2597 (100.0) |
| **Age group, years** | | | % | % | % | % | |
| 40–59 | 22.6 | 358 | 12.1 | | 59.6 | | |
| 60–69 | 34.7 | 1331 | 45.0 | 51.3 | 21.6 | 53.3 | 1385 (53.3) |
| 70–79 | 29.9 | 1045 | 35.4 | 40.2 | 12.9 | 32.0 | 830 (32.0) |
| ≥80 | 20.3 | 221 | 7.5 | 8.5 | 5.9 | 14.7 | 382 (14.7) |
| **Deprivation indicator** | | | | | | | |
| Least deprived | 40.1 | 482 | 16.3 | 18.6 | 21.6 | 22.0 | 571 (22.0) |
| Quintile 2 | 33.1 | 538 | 18.2 | 20.7 | 20.6 | 20.0 | 519 (20.0) |
| Quintile 3 | 29.2 | 592 | 20.0 | 22.8 | 19.9 | 20.3 | 527 (20.3) |
| Quintile 4 | 27.5 | 480 | 16.2 | 18.5 | 19.9 | 20.0 | 519 (20.0) |
| Most deprived | 22.9 | 505 | 17.1 | 19.4 | 18.0 | 17.8 | 461 (17.8) |

*Age distribution matched to prostate cancer survivors. †Source: Northern Ireland Statistics and Research Agency [24]. ‡By excluding those aged 40–59 years and weighting to the NI population by age and deprivation.

Multivariable analyses of the EPIC-26 domains and the self-assessed health rating were conducted using log-linear regression (backwards stepwise with the cut-off $P = 0.1$) of the continuous scores. Respondent's age, deprivation indicator, urban/rural indicator, marital status, employment status, carer status, number of long-term conditions, physical activity level, and body mass index (BMI), were investigated as independent variables. Regression residuals were not normally distributed while heteroscedasticity was also evident, thus standard errors were determined using bootstrapping. Results are presented as adjusted mean ratios relative to the baseline category. To investigate the relationship between urinary, bowel, and sexual dysfunction and general health, the self-assessed health rating was grouped into quartiles and added separately to the log-linear models for each EPIC-26 domain.

To investigate the relationship between the same list of covariates and the individual EQ-5D dimensions (with the outcome as 'With problems'), binary logistic regression with robust standard errors was utilised with results presented as odds ratios (ORs).

Analysis was conducted using the Statistical Package for the Social Sciences (SPSS® version 22; SPSS Inc., IBM Corp., Armonk, NY, USA).

## Results

In total, 10 000 men aged ≥40 years were sampled, with a response rate of 29.6% (2955 men). Response rates were highest for men aged 60–69 years and those who were resident in the least deprived areas (Table 1).

Completeness of data items was high, with 100% completeness for respondent characteristics provided by BSO (age, deprivation, urban/rural), whilst completeness of the self-reported characteristics ranged from 91.1% for both height and weight (used to create BMI) to 95.7% for employment status. Completeness of the composite EPIC-26 scores ranged from 73.3% for urinary irritation/obstruction to 91.0% for sexual function, whilst the self-assessed health rating was 97.8% complete.

Results for each question along with mean composite scores from the EPIC-26 and EQ-5D-5L survey instruments are presented in Tables S1–S3. Presented by age group (40–59, 60–69, 70–79 and ≥80 years) these data provide a baseline against which prostate cancer outcomes in similar populations can be measured.

### Urinary, Bowel and Sexual Dysfunction in the General Population

Generalising the data to the NI population by excluding men aged 40–59 years and applying survey weights, 2597 men aged ≥60 years were available for analysis (a response rate of 30.9% in this group). In all, 53.3% of the study population were aged 60–69 years ($n = 1385$) compared to 14.7% aged ≥80 years ($n = 382$). In all, 22.0% of the study population resided in the least deprived areas compared to 17.8% in the most deprived areas (Table 1).

### Urinary Incontinence

Almost one-third (31.1%) of men aged ≥60 years reported some degree of urinary leakage, with 5.6% reporting moderate/big problems. In all, 35.6% of men reported some urinary control difficulty, with 6.2% of men reporting no urinary control or frequent dribbling. One-quarter of men reported leaking urine more than once a week (26.4%), with 14.9% reporting leaking urine daily or more. When specifically asked about urinary function, 39.8% of men reported some level of difficulty, with 9.3% reporting moderate/big difficulties (Fig. 1, Table 2).

In multivariable analyses, urinary incontinence, based upon the EPIC-26 score (mean 89.0, median 100.0), increased with increasing age ($P = 0.048$), deprivation ($P = 0.024$), number of long-term conditions ($P = 0.001$), higher BMI ($P = 0.045$), and lower levels of physical activity ($P < 0.001$). Unemployed men were more likely to report urinary incontinence compared to employed men ($P = 0.036$) (Table 3).

### Urinary Irritation/Obstruction/Function

In all, 16.6% of men aged ≥60 years reported needing to urinate frequently as a moderate/big problem. Incomplete emptying was reported by 9.1%, bleeding with urination by 0.3%, and pain or burning on urination by 1.7% (Fig. 1).
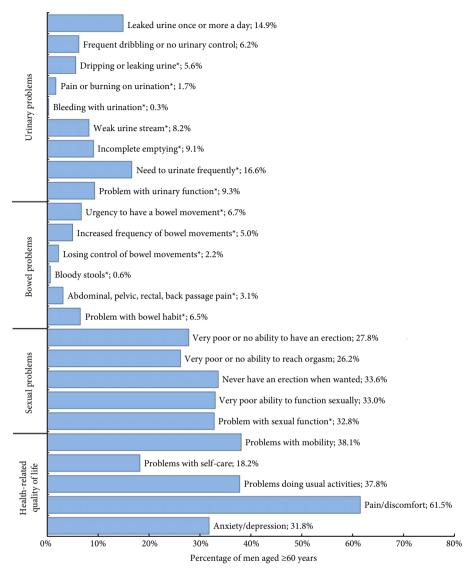
Based upon multivariable analysis of the EPIC-26 score (mean 88.5, median 93.8) urinary irritation/obstruction problems were associated with increasing age ($P = 0.072$), higher number of long-term conditions ($P < 0.001$), BMI (overweight vs obese, $P = 0.047$), and low physical activity (none vs 5–7 days/week, $P = 0.019$) (Table 3).

### Bowel Function

Bowel problems were reported to some degree by 26.1% of men aged ≥60 years, with 6.5% reporting moderate/big problems. Increased urgency (6.7%) and frequency of bowel movement (5.0%) were the most common problems, with abdominal, pelvic, rectal or back passage pain noted by 3.1%, and bloody stools reported by 0.6% of men (Fig. 1, Table 2).

After multivariable adjustments poorer bowel function scores (mean 93.6, median 100.0) were more commonly reported by those resident in urban areas ($P = 0.040$), unemployed ($P =$

**Fig. 1** Urinary, bowel and sexual dysfunction and HRQL for men aged ≥60 years in NI. Data are weighted to the NI population by age and deprivation. Responses to individual EPIC-26 and EQ-5D-5L questions, with *representing moderate/big problems. Complete responses to questions including a breakdown by age are available in Table S1.



0.013), with three or more long-term conditions (*P* < 0.001), no physical activity in the previous week (*P* = 0.019), and high BMI (*P* = 0.025) (Table 3).

## Sexual Function

Three out of five (57.9%) men reported some problem with sexual function, with 32.8% of all men reporting the problem as moderate/big and a similar proportion (33.0%) reporting very poor sexual functioning (Fig. 1, Table 2).

In multivariate analyses of the EPIC-26 score (mean 50.0, median 52.8) associations existed between sexual dysfunction and age, employment status, number of long-term conditions, physical activity, and BMI (all *P* ≤ 0.001) (Table 3).

## Combinations of Urinary Tract, Bowel and Sexual Dysfunction

Two out of five men (38.1%) reported at least one of urinary, bowel or sexual dysfunction, with 2.1% indicating they had all three issues (Fig. 2). Combinations of all three problems were more prevalent amongst men resident in deprived areas (*P* < 0.001), with increasing number of long-term conditions (*P* < 0.001), and with higher BMI (*P* = 0.002) (Table 2).

## HRQL in the General Population

In all, 61.5% of men aged ≥60 years reported some degree of pain/discomfort, whilst problems with mobility were reported

**Table 2** Urinary, bowel and sexual dysfunction amongst men aged ≥60 years in NI by age, deprivation, number of long-term conditions, physical activity, and BMI.

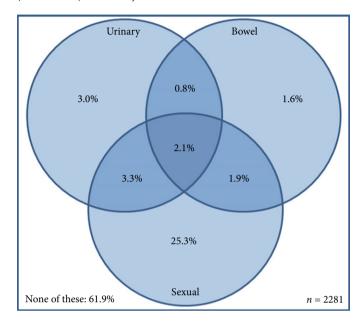| Variable | All respondents, *n* | Proportion of men aged ≥60 years reporting problems[†], % | | | | | | | |
| | | Individual conditions | | | Combinations of conditions (*n* = 2281) | | | | At least one of urinary, bowel or sexual dysfunction (*n* = 2281) |
| | | Urinary dysfunction (*n* = 2515) | Bowel dysfunction (*n* = 2547) | Sexual dysfunction (*n* = 2364) | Urinary and bowel dysfunction | Urinary and sexual dysfunction | Bowel and sexual dysfunction | Urinary, bowel and sexual dysfunction | |
| **Total** | 2597 | 9.3 | 6.5 | 32.8 | 2.9 | 5.4 | 4.0 | 2.1 | 38.1 |
| **Age group, years** | | $P < 0.001*$ | $P = 0.081$ | $P < 0.001*$ | $P = 0.316$ | $P = 0.155$ | $P = 0.230$ | $P = 0.766$ | $P < 0.001*$ |
| 60–69 | 1385 | 7.3 | 6.0 | 27.2 | 2.6 | 4.7 | 3.6 | 1.9 | 31.5 |
| 70–79 | 830 | 10.1 | 6.2 | 36.6 | 2.8 | 6.8 | 4.0 | 2.3 | 41.9 |
| ≥80 | 382 | 15.1 | 9.0 | 47.4 | 4.4 | 5.2 | 6.0 | 2.4 | 58.5 |
| **Deprivation indicator** | | $P = 0.001*$ | $P < 0.001*$ | $P < 0.001*$ | $P < 0.001*$ | $P < 0.001*$ | $P < 0.001*$ | $P < 0.001*$ | $P < 0.001*$ |
| Least deprived | 571 | 6.7 | 3.8 | 26.4 | 0.5 | 1.8 | 2.0 | 0.0 | 32.1 |
| Quintile 2 | 519 | 8.0 | 5.2 | 28.4 | 1.4 | 4.4 | 1.9 | 0.8 | 33.5 |
| Quintile 3 | 527 | 8.4 | 4.7 | 30.6 | 1.6 | 4.6 | 2.1 | 0.9 | 36.6 |
| Quintile 4 | 519 | 10.1 | 9.0 | 38.0 | 4.7 | 8.3 | 6.4 | 4.1 | 41.8 |
| Most deprived | 461 | 14.3 | 10.6 | 42.1 | 7.1 | 9.1 | 8.5 | 5.5 | 48.2 |
| **Number of long-term conditions** | | $P < 0.001*$ | $P < 0.001*$ | $P < 0.001*$ | $P < 0.001*$ | $P < 0.001*$ | $P < 0.001*$ | $P < 0.001*$ | $P < 0.001*$ |
| None | 747 | 5.3 | 0.9 | 19.3 | 0.4 | 1.8 | 0.5 | 0.4 | 22.7 |
| 1–2 | 1311 | 7.0 | 4.9 | 32.5 | 1.7 | 4.2 | 2.7 | 1.2 | 37.7 |
| ≥3 | 540 | 20.4 | 18.2 | 52.4 | 9.5 | 13.8 | 12.3 | 6.8 | 60.5 |
| **Physical activity** | | $P < 0.001*$ | $P < 0.001*$ | $P < 0.001*$ | $P < 0.001*$ | $P = 0.001*$ | $P < 0.001*$ | $P = 0.015$ | $P < 0.001*$ |
| None | 717 | 13.5 | 11.5 | 44.9 | 4.9 | 8.0 | 7.8 | 3.5 | 51.7 |
| 1–4 days of 30 min/day | 1164 | 6.9 | 5.3 | 28.6 | 2.0 | 4.6 | 3.0 | 1.6 | 33.2 |
| 5–7 days of 30 min/day | 486 | 7.0 | 3.5 | 27.2 | 2.2 | 3.6 | 2.3 | 1.4 | 31.5 |
| **BMI, kg/m²** | | $P = 0.003*$ | $P = 0.002*$ | $P < 0.001*$ | $P = 0.004*$ | $P < 0.001*$ | $P = 0.001*$ | $P = 0.002*$ | $P < 0.001*$ |
| Under and healthy weight (0–25) | 671 | 9.4 | 6.5 | 27.6 | 2.5 | 5.1 | 3.3 | 1.9 | 34.5 |
| Overweight (25–30) | 1060 | 7.2 | 5.1 | 31.3 | 2.3 | 4.3 | 3.2 | 1.5 | 35.4 |
| Obese (≥30) | 749 | 12.4 | 9.7 | 44.1 | 5.4 | 9.6 | 7.1 | 4.2 | 49.1 |

Data are weighted to the NI population by age and deprivation. Men can have multiple problems and thus may appear in more than one table column. [†]Moderate or big problems. *Significant at $P < 0.05$, after Bonferroni correction for multiple comparisons.

**Table 3** Adjusted urinary, bowel and sexual function mean score ratios (EPIC-26) for men aged ≥60 years in NI by demographic, socio-economic and health-related characteristics.

| Variable | Adjusted mean ratio (95% CI) | | | |
|---|---|---|---|---|
| | Urinary incontinence (n = 1691) | Urinary irritation/obstructive (n = 1668) | Bowel function (n = 1821) | Sexual function (n = 2007) |
| **Age group, years** | | | | |
| 60–69 | 1.00 | 1.00 | | 1.00 |
| 70–79 | 0.98 (0.96,1.00) | 0.99 (0.97,1.00) | N/S | 0.78 (0.73,0.82) |
| ≥80 | 0.96 (0.92,1.00) | 0.96 (0.92,1.00) | | 0.42 (0.35,0.50) |
| **Deprivation indicator** | | | | |
| Least deprived | 1.00 | N/S | N/S | N/S |
| Quintile 2 | 0.99 (0.96,1.01) | | | |
| Quintile 3 | 0.98 (0.96,1.01) | | | |
| Quintile 4 | 1.00 (0.98,1.03) | | | |
| Most deprived | 0.95 (0.92,0.98) | | | |
| **Urban/rural indicator** | | | | |
| Urban | N/S | N/S | 1.00 | N/S |
| Rural | | | 1.01 (1.00,1.02) | |
| **Employment status** | | | | |
| Employed/self-employed | 1.00 | N/S | 1.00 | 1.00 |
| Unemployed | 0.91 (0.83,0.98) | | 0.91 (0.86,0.97) | 0.76 (0.63,0.89) |
| Retired | 0.98 (0.96,1.00) | | 1.00 (0.99,1.02) | 0.90 (0.86,0.95) |
| Other | 0.98 (0.90,1.04) | | 0.99 (0.94,1.04) | 0.88 (0.72,1.01) |
| **Number of long-term conditions** | | | | |
| None | 1.00 | 1.00 | 1.00 | 1.00 |
| 1–2 | 0.98 (0.96,1.00) | 0.96 (0.95,0.98) | 0.98 (0.97,0.99) | 0.84 (0.79,0.88) |
| ≥3 | 0.90 (0.87,0.93) | 0.89 (0.87,0.91) | 0.90 (0.88,0.92) | 0.58 (0.52,0.64) |
| **Physical activity** | | | | |
| None | 1.00 | 1.00 | 1.00 | 1.00 |
| 1–4 days of 30 min/day | 1.04 (1.01,1.07) | 1.02 (0.99,1.04) | 1.01 (1.00,1.03) | 1.23 (1.14,1.32) |
| 5–7 days of 30 min/day | 1.07 (1.04,1.10) | 1.03 (1.00,1.05) | 1.03 (1.01,1.04) | 1.31 (1.21,1.41) |
| **BMI, kg/m²** | | | | |
| Under and healthy weight (0–25) | 1.00 | 1.00 | 1.00 | 1.00 |
| Overweight (25–30) | 1.01 (0.99,1.04) | 1.01 (0.99,1.02) | 1.01 (1.00,1.03) | 0.99 (0.95,1.04) |
| Obese (≥30) | 0.98 (0.95,1.01) | 0.98 (0.96,1.01) | 0.99 (0.97,1.01) | 0.83 (0.77,0.91) |

*Data are weighted to the NI population by age and deprivation. The adjusted mean score ratio was determined using a log-linear regression model with other significant variables as covariates. A value <1 can be interpreted as poorer functioning compared to the baseline category, whilst a value >1 can be interpreted as better functioning compared to the baseline category. N/S, not significant. Carer and marital status were not significant for any score. Unadjusted EPIC-26 scores by sociodemographic factors along with further descriptive data are available in Tables S2 and S3 and Fig. S1.*

**Fig. 2** Combinations of reported urinary, bowel and sexual dysfunction amongst men aged ≥60 years in NI. Data are weighted to the NI population by age and deprivation. Venn diagram is based upon the proportion of men reporting moderate/big problems in response to specific questions from the EPIC-26 question set (urinary: q2.6, bowel: q2.8, sexual: q2.13; File S1).



by 38.1%, performing usual activities by 37.8%, and anxiety/depression by 31.8%. One in five men (18.2%) had problems with self-care (Fig. 1).

Adjusted ORs for problems in all five domains increased with increasing number of long-term conditions, decreasing levels of physical activity and, except for anxiety/depression, with increasing BMI. Mobility problems and difficulties performing usual activities were more frequent in older men, whilst anxiety/depression levels decreased with increasing age. Reported problems in each domain increased with deprivation, with the exception of pain/discomfort, whilst living in an urban area was associated with reduced mobility and usual activities. Unemployed men reported more problems than employed or retired men. Married men reported fewer problems with mobility, self-care, and anxiety/depression than other marital status groups, whilst having carer responsibilities was not associated with any of the five dimensions (Table 4).

### General Health

In multivariate analyses, based upon self-assessed health rating (mean 77.2, median 80.0), poorer general health was associated with age ($P = 0.074$), deprivation ($P = 0.001$), marital status ($P = 0.071$), urbanity ($P = 0.008$), unemployment ($P < 0.001$), higher numbers of long-term conditions ($P < 0.001$), greater BMI ($P = 0.044$), and lower physical activity levels ($P < 0.001$) (Table 4).

### Relationship between General Health and Urinary, Bowel and Sexual Dysfunction

Increasing urinary, bowel and sexual dysfunction were associated with poorer general health in both univariable and multivariable analysis (all $P < 0.001$). The relationship was greatest for sexual dysfunction, with the mean sexual function domain score decreasing from 62.2 amongst men reporting good general health (score ≥90) to 29.7 for men reporting poorer general health (score <70). The weakest relationship was between self-assessed health rating and bowel dysfunction (Table 5).

## Discussion

The present study provides the most comprehensive description of urinary, bowel and sexual function, and their relationship to general health in elderly men resident in NI to date. It is specifically designed to provide a baseline to facilitate better estimation of the effects of prostate cancer and its treatments compared to the general population.

The data also allow a detailed assessment of the prevalence of these conditions in the general population. Almost two out of five (38.1%) men reported at least one of sexual, urinary and bowel function problem to a moderate/big degree. Sexual function issues were the most common with one-third of men reporting moderate or big problems, whilst 9.3% reported urinary dysfunction and 6.5% bowel dysfunction. A considerable proportion of additional men reported these problems to a small/very small degree, while men often experience multiple problems.

The present study adds information on sociodemographic, health-related factors and general health, and their associations with urinary, bowel and sexual difficulties. With the exception of bowel dysfunction these problems increased with increasing age. The prevalence of these difficulties was higher amongst those with higher BMI, lower physical activity levels, greater number of long-term conditions, and poorer general health. However, given the cross-sectional nature of the study these relationships are likely to be interrelated and we cannot draw conclusions about cause and effect. In addition, the lack of longitudinal data means that the results do not provide any information on reporting of how problems change over time with age. Nonetheless, these findings are of public health interest in light of the increasingly sedentary lifestyle and rising levels of obesity in the population [16].

### Comparison with Previous Studies

Our present findings on the prevalence of LUTS and faecal incontinence are comparable to other studies [5,6,12]. However, we found a lower prevalence of moderate-to-severe

**Table 4** Adjusted HRQL ORs (EQ-5D-5L) and adjusted self-assessed health rating mean score ratios (EuroQoL visual analogue scale [EQ-VAS]) for men aged ≥60 years in NI by demographic, socio-economic and health-related characteristics.

| Variable | OR (95% CI) | | | | | Mean ratio (95% CI) |
| --- | --- | --- | --- | --- | --- | --- |
| | Mobility (n = 2117) | Self-care (n = 2120) | Usual activities (n = 2153) | Pain/discomfort (n = 2153) | Anxiety/depression (n = 2278) | Self-assessed health rating (EQ-VAS) (n = 2120) |
| **Age group, years** | | | | | | |
| 60–69 | 1.00 | N/S | 1.00 | N/S | 1.00 | 1.00 |
| 70–79 | 1.37 (1.08,1.73) | | 1.14 (0.91,1.43) | | 0.63 (0.51,0.79) | 1.01 (0.99,1.03) |
| ≥80 | 2.64 (1.71,4.08) | | 1.98 (1.33,2.94) | | 0.63 (0.43,0.92) | 0.97 (0.93,1.00) |
| **Deprivation indicator** | | | | | | |
| Least deprived | 1.00 | 1.00 | 1.00 | N/S | 1.00 | 1.00 |
| Quintile 2 | 1.28 (0.90,1.82) | 1.68 (0.96,2.95) | 1.51 (1.08,2.12) | | 0.86 (0.61,1.19) | 0.99 (0.97,1.02) |
| Quintile 3 | 1.52 (1.06,2.18) | 1.84 (1.05,3.23) | 1.43 (1.01,2.02) | | 0.99 (0.72,1.36) | 0.97 (0.95,0.99) |
| Quintile 4 | 1.60 (1.10,2.35) | 2.66 (1.53,4.62) | 1.62 (1.13,2.33) | | 1.23 (0.88,1.71) | 0.97 (0.95,1.00) |
| Most deprived | 1.75 (1.21,2.52) | 2.65 (1.55,4.56) | 1.62 (1.13,2.32) | | 1.51 (1.10,2.08) | 0.95 (0.92,0.98) |
| **Urban/rural indicator** | | | | | | |
| Urban | 1.00 | N/S | 1.00 | N/S | N/S | 1.00 |
| Rural | 0.68 (0.53,0.88) | | 0.78 (0.62,0.99) | | | 1.02 (1.01,1.04) |
| **Marital status*** | | | | | | |
| Married | 1.00 | 1.00 | N/S | N/S | 1.00 | 1.00 |
| Separated/divorced | 1.51 (1.06,2.16) | 1.40 (0.87,2.25) | | | 1.37 (1.00,1.89) | 0.96 (0.93,1.00) |
| Widowed | 1.68 (1.10,2.57) | 1.97 (1.24,3.12) | | | 1.42 (0.98,2.05) | 0.98 (0.94,1.01) |
| Single | 1.14 (0.72,1.82) | 1.65 (0.95,2.89) | | | 1.28 (0.85,1.91) | 1.02 (0.98,1.06) |
| **Employment status** | | | | | | |
| Employed/self-employed | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Unemployed | 7.92 (4.28,14.65) | 14.64 (7.83,27.39) | 11.18 (5.87,21.28) | 2.84 (1.53,5.30) | 6.26 (3.55,11.03) | 0.71 (0.65,0.78) |
| Retired | 1.55 (1.16,2.07) | 2.53 (1.66,3.86) | 1.68 (1.27,2.21) | 1.34 (1.07,1.67) | 1.28 (0.99,1.66) | 0.96 (0.94,0.98) |
| Other | 2.43 (1.03,5.71) | 1.87 (0.45,7.76) | 1.78 (0.69,4.59) | 1.63 (0.74,3.60) | 2.36 (1.11,5.04) | 0.88 (0.78,0.97) |
| **Number of long-term conditions** | | | | | | |
| None | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| 1–2 | 2.41 (1.78,3.27) | 2.71 (1.56,4.71) | 2.36 (1.77,3.15) | 2.15 (1.72,2.68) | 1.44 (1.12,1.85) | 0.93 (0.92,0.95) |
| ≥3 | 7.75 (5.41,11.10) | 9.51 (5.37,16.84) | 7.36 (5.21,10.39) | 5.30 (3.84,7.33) | 3.78 (2.78,5.12) | 0.78 (0.75,0.80) |
| **Physical activity** | | | | | | |
| None | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| 1–4 days of 30 min/day | 0.38 (0.30,0.50) | 0.28 (0.20,0.38) | 0.39 (0.30,0.50) | 0.60 (0.46,0.77) | 0.57 (0.45,0.72) | 1.12 (1.09,1.15) |
| 5–7 days of 30 min/day | 0.18 (0.13,0.25) | 0.18 (0.12,0.27) | 0.22 (0.16,0.30) | 0.48 (0.37,0.63) | 0.41 (0.31,0.53) | 1.17 (1.14,1.21) |
| **BMI, kg/m²** | | | | | | |
| Under and healthy weight (0–25) | 1.00 | 1.00 | 1.00 | 1.00 | N/S | 1.00 |
| Overweight (25–30) | 1.11 (0.86,1.44) | 0.82 (0.58,1.16) | 1.03 (0.80,1.33) | 1.06 (0.85,1.32) | | 1.01 (0.99,1.03) |
| Obese (30+) | 1.77 (1.29,2.42) | 1.38 (0.93,2.03) | 1.55 (1.15,2.10) | 1.71 (1.29,2.28) | | 0.98 (0.96,1.01) |

*Data is weighted to the NI population by age and deprivation. The adjusted ORs were determined using a logistic regression model with other significant variables as covariates. The adjusted mean score ratio was determined using a log-linear regression model with other significant variables as covariates. A value <1 can be interpreted as poorer health compared to the baseline category, while a value >1 can be interpreted as better health compared to the baseline category. N/S, not significant. Carer status was not significant for any score. *Includes civil partnership equivalents. Unadjusted HRQL data by sociodemographic factors along with further descriptive data are available in Tables S4 and S5 and Fig. S2.*

**Table 5** Relationship between urinary, bowel and sexual function (EPIC-26) and general health (self-assessed health rating) for men aged ≥60 years in NI.

| | Mean urinary, bowel and sexual function scores (EPIC-26) | | | | | | | |
| | Urinary incontinence (n = 1949) | | Urinary irritation/obstructive (n = 1847) | | Bowel function (n = 2089) | | Sexual function (n = 2323) | |
| | Unadjusted mean | Adjusted mean ratio | Unadjusted mean | Adjusted mean ratio | Unadjusted mean | Adjusted mean ratio | Unadjusted mean | Adjusted mean ratio |
|---|---|---|---|---|---|---|---|---|
| Total | 89.0 | – | 88.5 | – | 93.6 | – | 50.0 | – |
| **Self-assessed health rating (EQ-VAS)** | P < 0.001* | P < 0.001* | P < 0.001* | P < 0.001* | P < 0.001* | P < 0.001* | P < 0.001* | P < 0.001* |
| ≥90 (better health) | 94.5 | 1.00 | 93.2 | 1.00 | 97.4 | 1.00 | 62.2 | 1.00 |
| 80–89.9 | 90.7 | 0.97 | 89.2 | 0.95 | 94.3 | 0.98 | 52.7 | 0.90 |
| 70–79.9 | 88.4 | 0.95 | 86.6 | 0.93 | 93.2 | 0.98 | 44.4 | 0.88 |
| <70 (poorer health) | 77.8 | 0.88 | 80.2 | 0.86 | 86.3 | 0.94 | 29.7 | 0.66 |

Data are weighted to the NI population by age and deprivation. The adjusted mean score ratio was determined using a log-linear regression model with significant variables from Table 3 used as covariates. A value <1 can be interpreted as poorer functioning compared to the baseline category, whilst a value >1 can be interpreted as better functioning compared to the baseline category. *Significant at P < 0.05 after Bonferroni correction for multiple comparisons (correction applies to unadjusted results only).

urinary incontinence (5.6% vs 11–16%) [5–8] than previously reported, possibly a result of using a much shorter time period for symptom reporting (1 vs 6–12 months). Conversely, we have identified a greater proportion with poor/no ability to have an erection (27.8% vs 5–10%) [4,9–11]; the difference is likely to be due to our cohort being slightly older (aged ≥60 vs 40–80 years). With the exception of the relationship to age [4,12,13] and some specific health conditions [25,26], the associations with health-related characteristics have not previously been reported. However, two North American studies specifically noted a lack of association that the present study found: One identifying no relationship between erectile dysfunction and physical activity [10], and another showing no relationship between faecal incontinence and BMI, physical activity, or number of chronic conditions [13].

## Implications for Primary Care

Primary care teams are well-placed initially to deal with problems relating to sexuality and urinary and bowel dysfunction; however, the extent of management in primary care appears limited [27]. A lack of pro-activity in relation to problems around sexual activity exists [28], with GPs having a lack of awareness, knowledge and confidence in dealing with sexual problems [29,30]. Embarrassment, negative attitudes toward sexuality in elderly people, and health professional disinterest can all inhibit discussions about these issues [29].

There is variation in the ability of GPs to deal with LUTS, and often reluctance to treat such conditions [30,31]. Combined with patient factors, such as unwillingness to acknowledge the problem [32,33], there are numerous barriers to the appropriate management of urinary symptoms in the elderly. Primary care needs to be more pro-active in identifying, managing and referring patients with these symptoms. If clinical contact is made, most men with LUTS, bowel and/or sexual dysfunction can potentially be managed effectively in primary care with lifestyle advice, counselling or medical therapy [34], and onward referral to urology services where necessary.

## Study Limitations

The response rate of 29.6% is lower than what would normally be expected from a general postal survey, but is similar to the 30–44% response rate of other postal surveys exploring detailed personal/sexual issues [11,35,36], including the widely used multinational survey of the aging male [4]. This is possibly a consequence of the use of a postal-only delivery method, the inclusion of very elderly men in the cohort, the length of time needed to complete the survey, and the inclusion of highly personal sexual dysfunction questions. The less than optimal response rate could potentially result in

response bias, with urinary, bowel and sexual dysfunction different amongst non-responders than for those who completed the survey. Similarly there may be a difference between men who partially and those who fully completed the survey. The impact of these issues is difficult to quantify given the lack of information on this topic in NI. Nevertheless, a sample of almost 3000 men was obtained with an age/deprivation distribution that only deviated slightly from that of the NI population. In addition, the proportion of men classified as obese in the present study is very similar to that in the NI health survey conducted in 2016/17 [37] (30.2% aged ≥60% vs 31.4% aged ≥65 years), whilst results for the EQ-5D amongst those aged ≥75 years from the same survey conducted in 2012/13 [38] compare favourably to the present results for those aged ≥80 years (mobility: 55% vs 61%; self-care: 25% vs 27%, usual activities: 50% vs 59%, pain/discomfort: 65% vs 62%, anxiety/depression: 30% vs 25%). Both comparisons suggest that the present study, aided by weighting adjustments, accurately represents the health of the NI population.

The present study was specifically designed to provide baseline data against which prostate cancer outcomes could be compared. Using the data for purposes other than this, such as generalising the data to the general population, has some limitations. Firstly, the exclusion of men with prostate cancer may result in an underestimation of the magnitude of urinary, bowel and sexual problems across the whole population. Secondly, the EPIC-26 question set provides respondent-rated symptoms rather than clinical assessment; they are thus subjective in that not all reported problems may require treatment or some men may have reported a problem as being small but would still benefit from health care intervention. Finally, this question set while validated for prostate cancer survivors has not been validated in the general population.

NI is broadly similar in terms of age and healthcare provision to the rest of the UK; however, there are differences which must be recognised when generalising the data to the entire UK. In particular, NI has a lower representation of ethnic minorities [24], higher unemployment [39], and lower life expectancy than the UK average [15], meaning that reported levels of urinary, bowel and sexual dysfunction in NI may be higher than in the UK overall. Similar differences are likely to be experienced if the data are used in other countries, thus in utilising the data outside of NI it may be beneficial to weight the presented results by age (to reflect the age distribution of the country being compared to), or to make any comparisons only for specific subgroups of the population (e.g. by excluding ethnic minorities or the most affluent from data from other countries).

## Conclusions

Urinary tract, bowel and sexual dysfunction are common amongst men aged ≥60 years. The high population prevalence must be considered when evaluating the impact of specific diseases and their treatments on function, otherwise inappropriate advice and therapies may be provided.

With almost two out of five men aged ≥60 years reporting moderate/big problems in at least one of these areas of function, there are clear implications for service providers and a need to encourage men experiencing difficulties to seek assistance. The reported problems are associated with the presence of long-term conditions, lower physical activity levels, higher BMI, age, and lower socio-economic status, with a strong relationship to general health also identified. This suggests that opportunities exist to reduce prevalence of these conditions through continued promotion of healthy lifestyles and by addressing health inequalities associated with socio-economic status.

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## Ethical Approval

Ethical approval was granted by The Office of Research Ethics Committees NI (ORECNI). Queen's University, Belfast was the study sponsor.

## Conflicts of Interest

Eila Watson reports grants from Oxford Brookes University during the conduct of the study. All other authors declare no competing interests.

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Abbreviations: BMI, body mass index; BSO, Health and Social Care Business Services Organisation; EPIC-26, 26-item Expanded Prostate Cancer Composite (questionnaire); EQ-5D-5L, EuroQoL five Dimensions five Levels (instrument); EQ-VAS, EuroQoL visual analogue scale; HRQL, health-related quality of life; LAPCD, Life After Prostate Cancer Diagnosis (study); NI, Northern Ireland; OR, odds ratio.

## Supporting Information

Additional Supporting Information may be found in the online version of this article:

**Table S1.** Responses to EPIC-26 questions by age group.
**Table S2.** Urinary, bowel and sexual function scores (EPIC-26) for men aged ≥60 years by demographic, socio-economic and health-related characteristics.

**Table S3.** Urinary, bowel and sexual function scores (EPIC-26) for men aged ≥60 years in NI by demographic, socio-economic and health-related characteristics – Detailed descriptive statistics.
**Table S4.** HRQL (EQ-5D-5L) and self-assessed health rating EuroQoL visual analogue scale (EQ-VAS) in men aged ≥60 years by demographic, socio-economic and health-related characteristics.
**Table S5.** Self-assessed health rating (EQ-VAS) for men aged ≥60 years in NI by demographic, socio-economic and health-related characteristics – Detailed descriptive statistics.
**Figure S1.** Urinary, bowel and sexual function scores (EPIC-26) for men aged ≥60 years in NI.
**Figure S2.** Self-assessed health rating (EQ-VAS) for men aged ≥60 years in NI.
**File S1.** Men's Health & Wellbeing Survey.