

# Prevalence estimates for lower urinary tract symptom severity among men in Uganda and sub-Saharan Africa based on regional prevalence data

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## Abstract

**Introduction:** In the absence of specific regional data, the prevalence of urinary symptoms in the developing world is currently estimated. Regional prevalence data and estimates based on them have relevance for accurate planning/provision of future healthcare. We sought to extrapolate prevalence estimates for lower urinary tract symptom (LUTS) severity and associated sexual dysfunction for Uganda as a whole and sub-Saharan Africa (SSA) using newly available regional data from a community-based cohort of men in Uganda.

**Methods:** Global Burden of Disease Study (GBDS) population statistics were applied to a regional dataset to provide prevalence estimates for Uganda and SSA; 415 men >55 years from five rural Ugandan communities had completed the International Prostate Symptom Scale (IPSS) and Epstein inventory to grade their LUTS severity and satisfaction with sexual function.

**Results:** Prevalence rates for moderate and severe LUTS were 40.5% and 20%, respectively, in men >55 in the Ugandan regional data; associated scores for all four Epstein sexual satisfaction measures were low. GBDS population figures (2016) for men >55 years are 942 115 (Uganda) and 33.9 million (SSA); hence, scaling up from regional prevalence data suggests 381 557 and 188 423 men >55 years in Uganda, and 13 729 500 and 6 780 000 in SSA have moderate and severe LUTS, respectively, and the majority will have compromise of elements of their sexual function.

**Conclusions:** Extrapolation from a small regional dataset (for which we have no guarantee of national or SSA representability) provides the first prevalence estimates for LUTS severity based on African data, and suggests a large proportion of men >55 years are troubled with LUTS and associated sexual dysfunction.

## Introduction

In Africa, as life expectancy and populations are increasing, the burden of care is also growing; as such, planning and pri-

oritization for appropriate healthcare provision is required.<sup>1</sup> However, in sub-Saharan Africa, scientific evidence on which to base health policies and decision-making is scarce,<sup>1,2</sup> and uncertainty in all-cause mortality estimates is high.<sup>2</sup> To accelerate progress towards better health and reduce the persistent differentials between poor and rich countries requires data on the frequency and impact of illness.<sup>1-3</sup> The Global Burden of Disease Study (GBDS) has developed population health measures that provide a denominator for comparisons of a wide array of health interventions and enable healthcare and research priorities to be set.<sup>3</sup> Problematically, much of Africa lacks the precise measures from which such data can be extrapolated. This critical feature was identified by Irwin et al, who stated that prevalence research can provide valuable information for planning and prioritizing programs, and how to best customize their objective, methodologies, and goals, especially in the developing regions of Africa.<sup>4</sup>

For example, direct measures of the frequency and severity of lower urinary tract symptoms (LUTS) in most African countries are lacking. Hence, the burden of LUTS in Africa has had to be extrapolated from worldwide estimates, as is the case for many other diseases. In 2011, it was predicted that by 2018 2.3 billion individuals worldwide would be affected by LUTS and 1.1 billion men would have symptoms of bladder outlet obstruction (BOO), with developing regions in Africa expected to be where the greatest global increase in LUTS would occur, with a projected increase of 31.1% between 2008 and 2018.<sup>4</sup> The health burden of BOO is high; many patients report quality of life is poor and with delayed or absent treatment, irreversible changes in the urinary tract develop, which can lead to urinary retention, renal failure, and premature death.<sup>5</sup> Yet with planning based on prevalence data, and provision of appropriate services and care, Africa has the potential to achieve a similar decrease in mortality from BOO as has been achieved in high-resource regions of the world.<sup>6</sup>

The purpose of this study was to generate prevalence estimates for LUTS and associated sexual dysfunction for

Uganda as a whole, and sub-Saharan Africa (SSA), from region-specific prevalence and severity data obtained in a recently completed community-based study of men in rural Uganda, by extrapolation using GBDS population estimates.<sup>3</sup>

## Methods

The prevalence extrapolation used previously collected region-specific data from the rural community of Sheema in Uganda, Africa, and employed validated quantitative measures that incorporate current International Continence Society (ICS) criteria and definitions. Full methods have been published previously.<sup>5</sup>

## Population and process

For the cross-sectional survey, at least 50 men over the age of 55 years were recruited from each of the five villages within the parish of Sheema. All subjects were volunteers; those with prior prostate surgery or prostate cancer were excluded. Community awareness was generated through radio broadcasts and posters at the local clinic. Ethical approval was obtained from the University of British Columbia and the Mbarara University of Science and Technology (certificate number 09/03-15).

After providing informed consent, all recruits were interviewed by trained interviewers to enable them to provide the responses necessary for the survey tools to be completed. To ensure comprehension and optimize individual responses, both instruments were translated and administered in the local dialect (Banyankole); the accuracy of the translation was checked by healthcare professionals fluent in both English and Banyankole. This use of local language and an interview format allowed subjects to participate regardless of their level of literacy and English comprehension.

## Questionnaires

The International Prostate Symptom Score (IPSS) is the gold standard measure for evaluation of LUTS developed by the American Urological Association (AUA),<sup>7</sup> and the Epstein inventory is a 45-question quality of life assessment scale that relates LUTS to health-related quality of life domains; four domains are specific to sexual function.<sup>8,9</sup>

## Analysis

Demographic data collected included age, marital status, educational level, employment status, availability of sufficient food, and if the subject was living with his symptoms in the community or had gone to a clinic for evaluation and treatment because of bother from LUTS. The IPSS total score classifies LUTS severity as mild (0–7), moderate (8–19), or severe

(20–35). The Epstein inventory sexual function items are: satisfaction with level of sexual activity or lack (scored from low to high, 0–10); frequency of sexual drive (scored from low to high, 1–8); frequency of erections when sexually stimulated (scored from low to high, 1–6); and change in sexual performance over the past year (scored poor to best, 1–7).

## Population data for extrapolation

Population statistics for Uganda and the sub-Saharan region were taken from GBDS 2016 population estimates data, 1950–2016.<sup>10</sup> The GBDS is coordinated by the Institute for Health Metrics and Evaluation. The purpose of the population data is to estimate the burden of diseases, injuries, and risk factors for 195 countries and territories and at the subnational level for a subset of countries. This dataset provides population estimates by location, age, and sex for 1950–2016. Data sources used to produce these estimates include World Population Prospects: 2015 Revision, from the United Nations Population Division, and the WHO Human Mortality Database. Region-specific prevalence data for LUTS and associated sexual dysfunction were multiplied by age appropriate GBDS population data to derive prevalence estimates for these conditions for Uganda as a whole and SSA.

## Results

The region-specific data from rural Uganda have been published previously;<sup>5</sup> the cohort included 415 men >55 years. A summary of the demographics of the population surveyed are shown in Table 1.

All subjects completed the IPSS and all but one the Epstein inventory (one subject declined to answer questions 2–4); calculations were done on the number of valid responses. Table 2 shows the prevalence of LUTS classified by IPSS severity and impact of LUTS on sexual function as measured by the Epstein inventory. Mild, moderate, and severe LUTS occurred in 39.5%, 40.5%, and 20% of the population, respectively. Almost all men with LUTS reported dissatisfaction with some aspects of their sexual function. Additional data on the prevalence of dissatisfaction with sexual function for each of the four categoric domains of the Epstein inventory classified by LUTS severity are provided in Supplementary Table 1. The associations between the other Epstein quality of life measures and LUTS severity have been published previously.<sup>5</sup>

Scaling up these region-specific data using GBDS population estimates for 2016 for men >55 years in Uganda (942 115) and SSA (33.9 million) suggests that 381 557 and 188 423 men in this age group in Uganda, and 13 729 500 and 6 780 000 in SSA overall have moderate and severe LUTS, respectively. And, prevalence estimates for sexual dysfunc-

**Table 1. Demographic characteristics of the regional study cohort surveyed in Sheema, Uganda**

Men >55 years (n)	415
Age, mean (SD) years	64.9 (12.3)
Symptom bother	
Living with symptoms	238 (57.3%)
Bothered enough to go to clinic	177 (42.7%)
Marital status n (%)	
Married	378 (91.1%)
Divorced/separated	6 (1.4%)
Widow	27 (6.5%)
Single	4 (1%)
Number of children, mean	7.5 (3.4)
Household size, mean	5.6 (2.9)
Highest level of education	
Never attended	98 (23.6%)
Primary school	258 (62.2%)
Secondary school	38 (9.2%)
Post-secondary	21 (5.1%)
Currently employed	
Yes	382 (92%)
No	33 (8%)
Sufficient food	
Yes	166 (40%)
No	249 (60%)

SD: standard deviation.

tion suggest that LUTS has an associated clinically significant negative impact on some aspects of sexual function in the majority of affected men >55 in Africa, and that the degree of dysfunction correlates with the severity of LUTS.

Based on the mean scores from the region-specific data for the four questions in the Epstein inventory (Table 2), sexual function deteriorates with increasing LUTS severity.

Men with IPSS of 0–7 and IPSS of 20–35, respectively, show a fall in satisfaction with level of sexual activity from 7.34 ( $\pm 2.68$ ) to 4.02 ( $\pm 3.14$ ); decreased frequency of sexual drive from 4.88 ( $\pm 1.63$ ) to 3.80 ( $\pm 2.0$ ); reduced erection frequency from 4.59 ( $\pm 1.44$ ) to 2.88 ( $\pm 1.31$ ); and, deterioration in performance over the past year from 3.58 ( $\pm 1.21$ ) to 2.53 ( $\pm 1.86$ ).

Extrapolation of the responses to the Epstein inventory (Supplementary Table 1) suggests that the majority of men in Africa >55 years with LUTS experience an associated nega-

tive impact on sexual function. Overall, 60% experienced worsening sexual performance in the past year and only 33.1% were satisfied with the level of their sexual activity. Scores for the four categorical domains also indicated that clinically significant sexual dysfunction occurs in a proportion of those with mild LUTS (IPSS 0–7), as 40.9% reported their sexual performance had worsened over the past year (score  $3.58 \pm 1.21$ ); 16.5% experienced no sexual drive or only 2–3 times per month (score  $4.88 \pm 1.63$ ); 12.2% reported no or little erection when sexually stimulated (score  $4.59 \pm 1.44$ ); and 9.1% reported being dissatisfied with their level of sexual activity (score  $7.34 \pm 2.68$ ).

## Discussion

The first prevalence estimates for LUTS and associated sexual dysfunction in Uganda and in SSA have been calculated by extrapolation of regional prevalence data from a recent community-based cohort study of men in rural Uganda. This regional prevalence study used the validated IPSS and Epstein inventory instruments, which incorporate current ICS definitions. As previously reported, these data documented a high incidence of LUTS, with increasing severity with age, and a high burden of associated sexual dysfunction that was statistically related to LUTS severity.<sup>5</sup>

Scaling up these regional prevalence data by multiplication with GBDS population data suggests that as many as 40.5% of men over the age of 55 years in Uganda as a whole and SSH overall suffer from moderate LUTS (IPSS  $\geq 8$ ), and one in 10 have severe symptoms (IPSS  $\geq 20$ ).<sup>7</sup>

As it is evident from the region-specific data from Uganda that impairment of sexual function is associated with LUTS in Africans, and this association has been reported previously in other populations,<sup>11</sup> it is likely most African men with LUTS are troubled by sexual dysfunction to some degree. But, because in the regional cohort, those who had moderate or severe LUTS reported dissatisfaction in all four Epstein inventory sexual health domains, and the degree to which each element was compromised correlated significantly with the severity of their LUTS, scaling up these data by multiplying by appropriate GBDS regional population estimates

**Table 2. LUTS prevalence and severity category by IPSS and comparison of sexual function (four-item Epstein inventory) by IPSS category**

LUTS by IPSS	Mild (0–7) n (%)	Moderate (8–19) n (%)	Severe (20–35) n (%)	Total
Men >55 years	164 (39.5)	167 (40.5)	83(20)	415
Sexual function by Epstein	Mean (SD)	Mean (SD)	Mean (SD)	414
Q1: Activity satisfaction	7.34 (2.68)	4.72 (3.25)	4.02 (3.14)	5.62 (3.32)
Q2: Drive frequency	4.88 (1.63)	4.05 (1.80)	3.80 (2.00)	4.33 (1.83)
Q3: Erection frequency	4.59 (1.44)	3.40 (1.44)	2.88 (1.31)	3.77 (1.57)
Q4: Performance change	3.58 (1.21)	2.81 (1.54)	2.53 (1.86)	3.06 (1.55)

IPSS: International Prostate Symptom Score; LUTS: lower urinary tract symptoms; SD: standard deviation.

indicates that the 60.5% of African men >55 years who likely have moderate or severe LUTS probably have significant associated sexual dysfunction.

However, as those with mild LUTS also reported dissatisfaction with their frequency of sexual drive, frequency of erections when sexually stimulated, or change in sexual performance over the last year, by extrapolation, prevalence estimates indicate that the majority of SSA men aged >55 years with LUTS can be expected to have clinically significant impairment of some aspects of their sexual function.

As justification for our approach, such calculations address an important epidemiological and research infrastructure challenge that many low- and middle-income countries (LMICs) face,<sup>1-3</sup> and the purpose of the GBDS population estimates is to enable burden of disease, injury, and risk factors to be estimated for the 195 countries and territories included in the database.<sup>3</sup> Hence, the extrapolation of regional prevalence data for LUTS and associated sexual dysfunction we made is appropriate, an improvement over using world estimates for African purposes, and a method that can be applied to other prevalence data from Africa and other LMICs that becomes available. However, it is not appropriate to apply statistical tests or construct any confidence intervals that rely on estimates derived in this way.

Importantly, both LUTS and symptoms of sexual function are amenable to treatment, and as healthcare planning, resource development, and service delivery in SSA expand to provide advanced care entities for these conditions,<sup>11</sup> accurate estimates of prevalence/incidence are important both to diagnose and treat LUTS and to understand the true burden of sexual dysfunction and identify risk factors for prevention.<sup>12</sup> Prevalence estimates based on region-specific data are relevant in this regard because, unlike prior estimates extrapolated from global projections, they more accurately reflect the actual burden and severity of disease in a given population.

A challenge with studies using epidemiological and symptom metrics tools related to both LUTS and sexual dysfunction is that up to now the definitions and criteria employed have often varied.<sup>4,12</sup> Recently, international bodies, such as the AUA, ICS, and International Urogynecological Association (IUGA), have standardized terminology and defined criteria so that it is now possible to use consistent terms and validated tools. Such tools include the IPSS and Epstein inventory, which allow us to collect data in regional studies that can be directly compared, and where necessary scaled up to give health planners and providers data with which to work.

A literature review found no prior surveys using the IPSS and Epstein tools together in SSA. The IPSS is the gold standard measure for LUTS and the Epstein inventory pairs well with the IPSS, as its multiple domains evaluate quality of life in the context of urinary symptoms and sexual function.

The IPSS has been used alone to assess the frequency and pattern of LUTS in men 40 years and older in Southwestern

Nigeria,<sup>13</sup> and in another study combined with digital rectal exam and prostate-specific antigen assay to evaluate the prevalence of LUTS/benign prostatic hyperplasia (BPH) as part of a screening survey of prostate cancer in men aged 50–74 in Accra, Ghana.<sup>14</sup> In the Nigerian cohort, LUTS severity was related to age, as we identified; in the age bracket >60 years the incidence of moderate-to-severe LUTS was 48.6%, while in our study it was 60.5% in men >55 years, with those presenting for treatment due to higher bother from LUTS being significantly older (67.5 years vs. 62.9) and having higher IPSS scores.<sup>5</sup> In the Ghanaian cohort, the prevalence of moderate-to-severe LUTS in the age bracket 50–94 years was 19.9%. However, the authors noted this prevalence is lower than that any reported for African American men of West African origin in other studies (prevalence of IPSS  $\geq 8$  ranges from 26–45%)<sup>14</sup> and suggested that, as the prevalence of prostate enlargement based on digital rectal exam in their study was 62.3%, the use of self-report of urinary symptoms in their population was not a reliable measure of BPH, perhaps due to cultural factors.<sup>13</sup>

African studies have used a variety of questionnaires to assess erectile dysfunction (ED); these include the International Index of Erectile Function (IIEF-5), Erection Hardness Score, and Aging Male Symptoms Scale, and a score developed for the Cross National Study.<sup>15-18</sup> The prevalence of ED has principally been studied in Nigerian men, with rates generally ranging from 41.5–58.9%,<sup>15,19-21</sup> with one outlier of 86.8%.<sup>22</sup> In another rural Ugandan population (Buluba), the rate reported was 47.8% overall (22.6% of the cohort was HIV+) and 36.8% in those HIV-negative; the influence of LUTS was not explored.<sup>16</sup> In Tanzania, among diabetic men, the rate was 55.1%.<sup>23</sup> A consistent finding in these studies was that ED severity correlated significantly with increasing age, as in our regional population data.<sup>9</sup> But Shaeer notes the distribution of factors differs across countries,<sup>15</sup> and it is particularly important that ED be studied in cultures different from those of the industrialized nations.<sup>24</sup>

To date, the estimates available suggest that LUTS is highly prevalent worldwide, with the number of affected individuals projected to increase with time, and the greatest burden anticipated in developing regions.<sup>4,25</sup> Irwin et al estimated that globally, Africa had the third greatest number of individuals affected, after Asia and Europe, and predicted the most rapid global increase (30.1%) in developing regions of Africa during the period 2008–2018 would result in an estimated prevalence of 44.2% for LUTS in men >20 years.<sup>4</sup> Our African regional data are limited to extrapolating prevalence in men aged >55 years, but suggest that in this age group, the prevalence of LUTS is higher; 60.5% experience moderate-to-severe symptoms, with severity increasing with advancing age and a high associated burden from sexual dysfunction.

Although not the highest priority in many respects, bladder disease demands attention because of the sheer number

of individuals affected in Africa and the negative impact on quality of life that affected individuals report.<sup>5,26</sup> It is important to note that among patients themselves, LUTS is ranked as a high priority for improved services, and especially for early diagnosis and access to therapy.<sup>27</sup> In SSA, Ikuerowo and Arogudade have identified late diagnosis of BOO and acute retention of urine due to obstruction as a major cause of morbidity and premature mortality due to complications that include infection, urinary retention, and renal failure.<sup>28,29</sup> Hence, even if the parallel issue of impaired sexual function is not considered, without access to diagnosis leading to effective medical therapy, untreated BOO will eventually progress to become severe in many of those affected.

Estimates for other urological problems are also relevant when considering the overall burden of bladder disease in Africa.<sup>4</sup> The number of individuals in Africa affected by overactive bladder is estimated to be the third highest globally and projected to have the greatest increase (31%) by 2018; similar estimates apply with regard to urinary incontinence. Future regional prevalence studies will also provide data for the planning and prioritization required for the advanced care needed for these urological conditions.<sup>30</sup> International guidelines now recommend drug therapy as the primary treatment to reduce the health burden of LUTS due to BOO;<sup>31</sup> such therapies are widely available and inexpensive in Africa.

We recognize limitations in what we report. The extrapolations of wider prevalence made from this small regional dataset are only estimates, and we have no guarantee of the national or SSA representability of the GBDS population estimates on which they are based. However, these data are generated by the Institute for Health Metrics and Evaluation for the purpose of generating estimates of the burden of diseases, injuries, and risk factors.<sup>3</sup> Hence, we suggest our data are important, as regional prevalence estimates are needed for future healthcare provision,<sup>1-3</sup> and also because our calculations demonstrate that such data can be generated from regional datasets collected in Africa. We also recognize that the previously reported regional prevalence data from which the Ugandan and SSA prevalence estimates we report are extrapolated only included 415 subjects; however, data capture was comprehensive, all respondents completed the IPSS, and only one subject declined to complete all four of the Epstein inventory sexual health questions. In addition, these tools incorporate current ICS definitions and lend themselves to translation and administration by interview so that data capture is excellent and selection bias due to exclusion of subjects because of language/comprehension/literacy issues is avoided. Thus, cohorts studied are broad and representative.

## Conclusion

Extrapolation from novel regional data provides the first prevalence estimates for LUTS frequency and severity and associated sexual impairment based on actual African data, rather than estimates from global projections. The indication is that the burden of LUTS-related disease in Uganda and SSA in men is high. Novel region-specific data using validated instruments show that 60.5% of men >55 years in rural Uganda have moderate or severe LUTS, and the majority of those with LUTS report associated dissatisfaction with their sexual function. Such prevalence estimates based on region-specific data are called for to facilitate appropriate planning for advanced healthcare service delivery in Africa and other LMICs.

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**Supplementary Table 1. Prevalence data and comparison of four Epstein inventory categoric question domains for sexual health by IPSS severity**

	International Prostate Symptom Score (IPSS)			Total
	Mild (0–7) n (%)	Moderate (8–19) n (%)	Severe (20–35) n (%)	
<b>Question 1: How satisfied are you with the level of sexual activity or lack?</b>				
Dissatisfied (0–3)	15 (9.1%)	67 (40.1%)	37 (44.6%)	119 (28.7%)
Midrange (4–7)	62 (37.8%)	63 (37.7%)	33 (39.8%)	158 (38.2%)
Satisfied (8–10)	87 (53.0%)	37 (22.2%)	13 (15.7%)	137 (33.1%)
<b>Question 2: How frequently have you felt sexual drive?</b>				
None to 2–3x/ month	27 (16.5%)	62 (37.1%)	34 (41.0%)	123 (29.7%)
1–3x/week	81 (49.4%)	69 (41.3%)	31 (37.3%)	181 (43.7%)
4 or more x / week	56 (34.1%)	36 (21.6%)	18 (21.7%)	110 (26.6%)
<b>Question 3: How often are you able to have erections when sexually stimulated?</b>				
None/a little	20 (12.2%)	59 (35.5%)	38 (45.8%)	117 (28.3%)
Some/a good bit	40 (24.4%)	64 (38.6%)	33 (39.8%)	137 (33.2%)
Most/all	104 (63.4%)	43 (25.9%)	12 (14.5%)	159 (38.5%)
<b>Question 4: Over the past year how has sexual performance changed?</b>				
Worse	67 (40.9%)	119 (71.7%)	62 (74.7%)	248 (60.0%)
About the same	74 (45.1%)	24 (14.5%)	4 (4.8%)	102 (24.7%)
Better	23 (14.0%)	23 (13.9%)	17 (20.5%)	63 (15.3%)

Chi-square  $p < 0.001$  for all.