# The Demographic Burden of Urologic Diseases in America

David C. Miller, MD, MPH[a], Christopher S. Saigal, MD, MPH[b,c], Mark S. Litwin, MD, MPH[b,c,d,*]

**KEYWORDS**

• Benign prostatic hyperplasia • Urinary incontinence
• Erectile dysfunction • Prostate cancer • Bladder cancer
• Hypospadias • Undescended testis
• Vesicoureteral reflux

The National Institute of Diabetes and Digestive and Kidney Diseases initiated the Urologic Diseases in America (UDA)[1] project in 2001 with the goal of quantifying the immense demographic burden of urologic diseases on the American public, in both human and financial terms (**Box 1**). This effort was renewed in 2007 with the aim of expanding and deepening analyses of the epidemiology, costs, and quality of medical care in urology. This ongoing commitment recognizes the major public health impact of urologic conditions in the United States. Urologic disorders occur from the earliest stages in development through the end of life. Many are chronic and affect individuals not by shortening survival, but by impairing quality of life. The economic impact of urologic diseases is often substantial for patients and families, employers, payers, and society at large (**Tables 1** and **2**). Moreover, physician practice and patient care-seeking behavior in urology have changed dramatically in response to a variety of financial and nonfinancial incentives in recent years. A thoughtful policy response to these changes requires a thorough understanding of the health care resource use and clinical epidemiology relevant to urologic diseases in America, particularly as society prepares for the large demographic shifts expected as the baby boom generation ages.

UDA analyses use multiple and diverse sources of epidemiologic and health services data to document one or more of the following trends for a broad spectrum of urologic disease: (1) demographic and secular trends in overall costs; (2) changes in physician practice patterns for diagnostic and therapeutic interventions; (3) changes in the specialty of treating physicians; (4) changes in the demographic characteristics of patients and treating physicians; and (5) demographic and secular trends in resource use, such as inpatient hospital resources, length of stay, outpatient physician and facility resources, use of pharmaceuticals and durable medical equipment, and availability and type of insurance coverage. Until the UDA project, no authoritative omnibus had compiled a comprehensive set of data analyses that synthesized information available from myriad national and regional sources across the public and private sectors in the United States. These sources, rich with epidemiologic and economic data on trends in the diagnosis and management of urologic diseases, were prodigiously tapped for a UDA compendium prepared by the University of California, Los Angeles, and RAND in 2007 (www.uda.niddk.nih.gov and www.udaonline.net). This article details major initial findings from the UDA project with respect to the demographic

This work was supported by award No. N01-DK-1-2460 from the National Institutes of Health.
[a] Departments of Urology and Epidemiology, University of Michigan, Ann Arbor, MI, USA
[b] Department of Urology, David Geffen School of Medicine, University of California, Los Angeles, CA, USA
[c] Department of Health Services, School of Public Health, University of California, Los Angeles, CA, USA
[d] Jonsson Comprehensive Cancer Center, University of California, Los Angeles, CA, USA
* Corresponding author.
*E-mail address:* mlitwin@mednet.ucla.edu (M.S. Litwin).

Urol Clin N Am 36 (2009) 11–27
doi:10.1016/j.ucl.2008.08.004
0094-0143/08/$ – see front matter 

**Box 1**
**Conditions analyzed in urologic diseases in America project**

*Prostate*
Chronic and acute prostatitis
Benign prostatic hyperplasia
Prostate cancer
*Bladder*
Interstitial cystitis and painful bladder syndrome
Urinary incontinence in women
Urinary incontinence in men
Bladder cancer
*Kidney*
Urolithiasis
Ureteropelvic junction obstruction
Kidney cancer
*Pediatrics*
Vesicoureteral reflux
Undescended testis
Hypospadias
Ureterocele
Posterior urethral valves
Urinary tract infection in children
Urinary incontinence in children
*Male Health*
Infertility
Erectile dysfunction and Peyronie's disease
Urethral stricture
Testicular cancer
*Infections*
Urinary tract infection in women
Urinary tract infection in men
Sexually transmitted diseases

impact of the most common benign, malignant, and pediatric urologic conditions.

## BENIGN UROLOGIC CONDITIONS

### *Benign Prostatic Hyperplasia*

Benign prostatic hyperplasia (BPH), a chronic and often progressive condition, affects nearly three in four men by the seventh decade of life. Recognizing its clinical and public health significance, UDA investigators used a variety of data sources, including administrative data sets, large national health surveys, and community-based studies, to characterize the demographic burden of illness attributable to BPH and its associated medical care.

For an increasing number of men with BPH, the outpatient physician office represents the portal of entry into the health care system. Illustrating this trend with data from the National Ambulatory Medical Care Survey (NAMCS) and the National Hospital Ambulatory Medical Care Survey, an increase in the number of outpatient visits for BPH from 10,116 per 100,000 in 1994 to 14,473 per 100,000 in 2000 was observed (**Table 3**). During the same period, BPH-related emergency room visits decreased from 330 per 100,000 in 1994 to 218 per 100,000 in 2000.[2] Follow-up visits for imaging, prescriptions, and office-based surgical interventions are likely to be contributing factors to this trend.

Other UDA data sources allowed characterization of the clinical evaluations, medical therapies, and procedural interventions that accompany these outpatient visits. For instance, most urologists recommend medical therapy with α-blockers or 5-α-reductase inhibitors as first-line treatment for men with symptomatic BPH.[3] NAMCS data provide empiric support for this practice pattern.[2] Specifically, in 2000, 23% of prescriptions written at BPH-related outpatient visits were for the α-blockers, doxazosin and tamsulosin. That year, only 7.3% of BPH-related outpatient visits culminated in a prescription for the 5-α-reductase inhibitor, finasteride. The widespread use of these pharmacologic agents is supported by a broad clinical literature including the landmark National Institute of Diabetes and Digestive and Kidney Diseases–funded Medical Therapy of Prostatic Symptoms study, which demonstrated that combination therapy (α-blocker and 5-α-reductase inhibitor) was nearly twice as effective as monotherapy for decreasing the risk of clinical progression (66% risk reduction for the combination, 39% for doxazosin, and 34% for finasteride).[4]

UDA analyses also described the use of emerging, minimally invasive surgical therapies for BPH, including laser ablation, transurethral needle ablation, transurethral microwave therapy, high-energy focused ultrasound, and hot water thermotherapy. According to data from the Health care Cost and Use Project, inpatient admissions for certain minimally invasive BPH surgeries (transurethral needle ablation and microwave therapy) increased from 1990 through 2000. It is interesting to note that, although these procedures are typically described as ''office-based,'' at least at the beginning of their adoption curve a portion were being performed as inpatient procedures.

BPH procedures in the ambulatory surgery setting increased concurrently. For instance, population-based incidence rates for minimally invasive surgical therapies increased from 264 per 100,000 in 1998 to 357 per 100,000 in 2000. Concurrent with data supporting effective medical therapy for BPH and the introduction of minimally invasive treatment options, national rates of transurethral resection of the prostate decreased steadily in the 1990s.[2]

### *Urinary Incontinence in Women*

Because women may be reluctant to discuss urinary incontinence (UI) with their physicians or believe it is part of normal aging, using physician office visits to describe the prevalence of UI may substantially underestimate its true burden. Population-based data, in contrast, are derived from surveys of individuals who are not necessarily seeking care, and have greater sensitivity for capturing the true burden of UI among American women.

Analyses of population-based data from the National Health and Nutrition Examination Survey (NHANES) estimated a 38% prevalence of UI among women greater than or equal to 60 years old surveyed from 1999 to 2000. When stratified by frequency of episodes, 13.7% of all women in NHANES reported daily incontinence, whereas an additional 10.3% reported weekly incontinence. The prevalence of daily incontinence increased with age, ranging from 12.2% in all women 60 to 64 years old to 19.4% in those greater than or equal to 85 years old.[5] Women with less than a high school education reported incontinence less often than did those with at least a high school education. Prevalence was higher in non-Hispanic white women (41%) than in non-Hispanic black (20%) or Mexican American (36%) women (**Table 4**). These data are consistent with other large, population-based studies that estimate a higher prevalence of UI in non-Hispanic white women than in other ethnic or racial groups.[6,7] The annual rate of hospitalizations for a primary diagnosis of UI, most of which are presumably for incontinence surgery, remained stable at 51 to 54 per 100,000 between 1994 and 1998. The rate decreased to 44 per 100,000 in 2000, consistent with a shift to ambulatory surgery and hospital outpatient treatment of women with incontinence. The annual hospitalization rate was highest for women between the ages of 65 and 74 years (108 per 100,000) and for women residing in the South and West. Urban dwellers had a higher rate of hospitalizations than did rural dwellers. Hospital stays were longer for older women.[5]

In contrast to the decreasing hospitalization rate for incontinence between 1992 and 2000, outpatient visits for UI more than doubled during this period. Physician visits linked with a UI diagnosis increased from 845 per 100,000 women in 1992 to 1845 per 100,000 in 2000. Similarly, visits for which UI was the primary diagnosis increased from 468 per 100,000 in 1992 to 1107 per 100,000 in 2000.[5] Office visits for incontinence by female Medicare beneficiaries ($\geq$65 years old) increased from 1371 per 100,000 in 1992 to 2937 per 100,000 in 1998. The rate in white women approximately doubled that in African American, Asian American, or Pacific Islander women, and was 50% higher than that in Hispanic women.

Despite its adverse quality of life effects, fewer than half of women with incontinence seek care for this chronic condition.[5] Although only a small fraction of women with UI seek surgical intervention, the number treated surgically is nonetheless substantial and accounts for a considerable proportion of incontinence-related expenditures.[8,9] UDA analyses revealed that among women with commercial health insurance the rate of inpatient hospitalizations for incontinence procedures (as the primary or a secondary procedure) ranged from 123 per 100,000 in 1994 to 114 per 100,000 in 2000. Hospitalizations for incontinence surgeries as the primary procedure decreased from 59 per 100,000 women in 1994 to 33 per 100,000 in 2000. Consistent and substantial geographic variation is also noted in rates of incontinence surgery. For instance, between 1994 and 2000 rates of hospitalization for incontinence-related surgery ranged from 74 to 114 per 100,000 women in the Northeast United States to 217 to 306 per 100,000 in the West.[5]

In 1998, collagen injection, pubovaginal sling, and anterior urethropexy were the most commonly performed surgical procedures for female UI. This pattern reflects increased use of pubovaginal slings among incontinent women from 1995 (621 per 100,000 women) to 1998 (2776 per 100,000). Although still common, the number of anterior urethropexies decreased between 1992 (3941 per 100,000) and 1998 (2364 per 100,000). During the same interval, nationwide use of needle suspension procedures (the so-called "Raz" and "Pereyra" procedures) decreased precipitously.

UDA analyses also captured initial trends toward more frequent ambulatory surgical care for female UI. Among commercially insured women less than or equal to age 65, the rate of ambulatory surgery visits for UI increased from 15 per 100,000 in 1994 to 34 per 100,000 in

**Table 1**
**Burden of selected urologic diseases in America in 2000**

| | No. Visits to Office-Based Physicians (NAMCS) Plus Hospital Outpatient Clinics (NHAMCS) | | No. Visits to Emergency Rooms (NHAMCS) | No. Hospital Stays | Total Expenditures (Million $)[a] |
|---|---|---|---|---|---|
| | Primary Diagnosis | Any Diagnosis | | | |
| **Prostate** | | | | | |
| Chronic and acute prostatitis | — | 1,841,066 | — | — | $84,452,000 |
| Benign prostatic hyperplasia | 4,418,425 | 7,797,781 | 117,413 | 105,185 | $1099.5 |
| Prostate cancer | 3,330,196 | — | — | — | $1,295,800,312 |
| **Bladder** | | | | | |
| Interstitial cystitis, painful bladder syndrome | — | — | — | — | $65,927,937 |
| Urinary incontinence in women | 1,159,877[c] | 2,130,929 | — | 46,470 | $452.8 |
| Urinary incontinence in men | 207,595 | 353,065 | — | 1332 | $10.3 |
| Bladder cancer | — | — | — | — | — |
| Lower tract transitional cell cancer | — | 832,416 | — | — | $1,073,803,094 |
| Upper tract transitional cell cancer | — | — | — | — | $64,309,807 |
| **Kidney** | | | | | |
| Urolithiasis | 1,996,907 | 2,682,290 | 617,647 | 177,496 | $2067.4 |
| Kidney cancer | — | 279,564 | — | — | $401,390,672 |

| | | | | | |
|---|---|---|---|---|---|
| **Pediatric urologic disorders** | | | | | |
| Vesicoureteral reflux | 83,791[c] | 140,098[b] | — | — | $41,725,663 |
| Undescended testis | 148,551 | 215,482 | — | — | — |
| Hypospadias | — | 17,364[c] | — | — | $16,563,330 |
| Ureterocele | — | — | — | — | $16,803,712 |
| **Male reproductive health** | | | | | |
| Infertility | — | 158,413[b] | — | — | $17,046,404 |
| Erectile dysfunction | — | 2,904,896 | — | — | $327,626,849 |
| Peyronie's disease | — | — | — | — | — |
| Urethral stricture | — | 364,389 | — | — | $191,074,350 |
| Testicular cancer | — | 14,790 | — | — | $21,745,500 |
| **Infections** | | | | | |
| Urinary tract infections in women | 6,860,160 | 8,966,738 | 1,311,359 | 245,879 | $2474 |
| Urinary tract infections in men | 1,409,963 | 2,049,232 | 424,705 | 121,367 | $1027.9 |

[a] Based on data from National Ambulatory Medical Care Survey (NAMCS), National Hospital Ambulatory Medical Care Survey (NHAMCS), Health care Cost and Use Project (HCUP), and Medical Expenditure Panel Survey (MEPS).
[b] Physician office visits only.
[c] Hospital outpatient visits only.

**Table 2**
**Estimated incremental annual expenditures associated with various urologic diagnoses (per individual)**

| Diagnosis | Individual Annual Cost ($)[a] |
|---|---|
| Renal cell cancer | 12,155 |
| Bladder cancer | 9585 |
| Prostate cancer | 7019 |
| Testicular cancer | 6236 |
| Urinary incontinence | 4498 |
| Urolithiasis | 4472 |
| Painful bladder syndrome | 4396 |
| Interstitial cystitis | 4251 |
| Urinary tract infection in men | 2829 |
| Chronic and acute prostatitis | 1759 |
| Urinary tract infection in women | 1574 |
| Benign prostatic hyperplasia | 1536 |
| Erectile dysfunction | 1101 |

[a] Privately insured patients 18–64 years old.

2000. Likewise, the rate of ambulatory surgical center visits by older (≥65 years) Medicare beneficiaries with UI increased from 60 per 100,000 in 1992 to 142 per 100,000 in 1998.[5] During this interval, the increasing use of ambulatory surgery likely reflected the emergence of injectable periurethral bulking agents for female stress incontinence.[10]

### *Urinary Incontinence in Female Nursing Home Residents*

Identification of incontinence at the time of nursing home admission, typically relying on resident medical records, suggests that only 1% to 2% have a diagnosis of incontinence.[11] Clinical studies reveal, however, that a much larger proportion actually has UI at nursing home admission.[12] To

**Table 3**
**National physician office and hospital outpatient visits for benign prostatic hyperplasia or lower urinary tract symptoms**

| | Count | Rate (95% CI) |
|---|---|---|
| 1994 | | |
| Primary reason | 2,899,300 | 6371 (5495–7248) |
| Any reason | 4,603,426 | 10,116 (8826–11,406) |
| 1996 | | |
| Primary reason | 3,658,367 | 7484 (6294–8675) |
| Any reason | 6,112,287 | 12,505 (10,856–14,153) |
| 1998 | | |
| Primary reason | 3,990,359 | 7754 (6281–9226) |
| Any reason | 6,443,185 | 12,520 (10,531–14,508) |
| 2000 | | |
| Primary reason | 4,418,425 | 8201 (6765–9637) |
| Any reason | 7,797,781 | 14,473 (12,406–16,540) |

Rate per 100,000 based on 1994, 1996, 1998, and 2000 population estimates from Current Population Survey for relevant demographic categories of American male civilian noninstitutionalized population ≥40 years old.

*Data from* Litwin MS, Saigal CS, editors. Urologic diseases in America. NIH Publication No. 07–5512. Washington: US Department of Health and Human Services, Public Health Service, National Institutes of Health, National Institute of Diabetes and Digestive and Kidney Diseases, US Government Publishing Office; 2007.

**Table 4**
**Prevalence of difficulty controlling bladder in women**

| | Total No. | No. with Difficulty (%) | No. without Difficulty (%) | No. Refused to Answer or Do Not Know (%) |
|---|---|---|---|---|
| Totals | 23,477,726 | 8,929,543 (38) | 14,449,905 (62) | 98,278 (0) |
| Age at screening | | | | |
| 60–64 | 5,699,785 | 2,168,863 (38) | 3,530,922 (62) | 0 |
| 65–69 | 4,895,878 | 1,785,380 (36) | 3,110,498 (64) | 0 |
| 70–74 | 4,505,164 | 1,683,804 (37) | 2,818,651 (63) | 2709 (0) |
| 75–79 | 3,453,472 | 1,515,900 (44) | 1,873,616 (54) | 63,956 (2) |
| 80–84 | 2,981,558 | 989,003 (33) | 1,967,390 (66) | 25,165 (1) |
| 85+ | 1,941,869 | 786,593 (41) | 1,148,828 (59) | 6448 (0) |
| Race and ethnicity | | | | |
| Non-Hispanic white | 18,729,539 | 7,662,444 (41) | 11,041,930 (59) | 25,165 (0) |
| Non-Hispanic black | 1,941,269 | 386,480 (20) | 1,554,789 (80) | 0 |
| Mexican American | 649,003 | 230,567 (36) | 409,279 (63) | 9157 (1) |
| Other Hispanic | 1,576,419 | 468,823 (30) | 1,107,596 (70) | 0 |
| Other race and ethnicity | 581,496 | 181,229 (31) | 336,311 (58) | 63,956 (11) |
| Education | | | | |
| Less than high school | 8,374,762 | 2,692,649 (32) | 5,682,113 (68) | 0 |
| High school | 7,692,149 | 3,484,970 (45) | 4,207,179 (55) | 0 |
| High school or greater | 7,212,158 | 2,725,611 (38) | 4,461,382 (62) | 25,165 (0) |
| Refused | 103,678 | 26,313 (25) | 13,409 (13) | 63,956 (62) |
| Do not know | 87,647 | 0 | 85,822 (98) | 1825 (2) |
| Missing | 7332 | 0 | 0 | 7332 (100) |
| Poverty-to-income ratio | | | | |
| 0 | 111,440 | 31,876 (29) | 79,564 (71) | 0 |
| Less than 1 | 3,145,548 | 1,116,508 (35) | 2,026,331 (64) | 2709 (0) |
| 1.00–1.84 | 5,520,548 | 2,193,641 (40) | 3,326,907 (60) | 0 |
| Refused | 2,090,410 | 759,112 (36) | 1,331,298 (64) | 0 |
| Do not know | 1,560,474 | 741,618 (48) | 817,031 (52) | 1825 (0) |
| Missing | 1,399,975 | 548,182 (39) | 783,214 (56) | 68,579 (5) |

Based on question KIQ.040, "In the past 12 months, have you had difficulty controlling your bladder, including leaking small amounts of urine when you cough or sneeze?" (do not include bladder control difficulties during pregnancy or recovery from childbirth).

*Data from* McConnell JD, Roehrborn CG, Bautista OM, et al. The long-term effect of doxazosin, finasteride, and combination therapy on the clinical progression of benign prostatic hyperplasia. N Engl J Med 2003;349:2387–98.

explore this difference, UDA researchers used data from the National Nursing Home Survey to compare administrative and clinical estimates of the prevalence of incontinence within the same vulnerable population.[13]

Among female nursing home residents with an admitting or current diagnosis of incontinence in their medical records 73.8% to 85.4% was identified by the National Nursing Home Survey as having difficulty controlling urination, and 9.5% to 11.7% had an indwelling urethral catheter (or urinary stoma). Moreover, well over half of those with incontinence required personal assistance and almost one fourth required special equipment when using the toilet.[13] Among the entire population of female nursing home residents (regardless of record-based continence status) 56.3% to 58.6% were reported to have difficulty controlling urination. This rate was stable between 1995 and 1999. Fully 56.6% of these patients required personal assistance and 15.2% required special equipment when using the toilet.

Nursing home residents with incontinence were older than those without incontinence. In 1999, 50.7% of incontinent women were greater than or equal to 85 years old, 31.5% were 75 to 84 years old, and 17.8% were less than or equal to 74 years old (**Table 5**). In contrast, 41.5% of those without incontinence were greater than or equal to 85 years old, 32.2% were 75 to 84 years old, and 26.2% less than or equal to 74 years old. Race and ethnicity did not differ between the incontinent and continent nursing home residents (see **Table 5**).[13]

Compared with existing administrative data, UDA analyses identified a much greater prevalence (58.6%) of urinary control problems among women living in nursing homes. More than half of all female nursing home residents had difficulty controlling urination or needed assistance while using the toilet. The sharp divergence between clinical and administrative data highlights the limitations of using medical records alone to study the epidemiology of UI.

### *Erectile Dysfunction*

According to 2001 to 2002 population-based NHANES data, nearly one in five men experience erectile dysfunction (ED), as defined by self-reports that they are sometimes or never able "to get and keep an erection adequate for satisfactory intercourse."[14] Based on this definition, the prevalence of ED in the United States demonstrates a monotonous increase with advancing age, because more than 75% of men older than 75 meet this self-reported diagnostic criterion (compared with fewer than 10% of men $\leq$40).

In terms of resource use, ED-related health care is increasingly provided in the outpatient setting. For instance, among male Medicare beneficiaries the age-adjusted rate of physician office visits with a primary ED diagnosis more than doubled between 1992 (1609 per 100,000) and 1998 (3387 per 100,000). Similar trends exist for national hospital outpatient visits with ED listed as any diagnosis,[15] and these temporal trends are consistent across age, race and ethnicity, and geographic strata. The rising use of physician office and hospital outpatient visits during this interval likely reflects the concurrent introduction of oral phosphodiesterase inhibitors as first-line ED therapy. Also consistent with this explanation is the corresponding decline in ED-related inpatient surgery rates and expenditures in data from the Health care Cost and Use Project and Medicare.

Among Medicare beneficiaries the subsequent decline (after 1998) in the rate of outpatient visits with ED listed as the primary diagnosis may reflect the management of ED by primary care providers without physiologic testing or diagnostic coding. Patients may also have other conditions as the primary reason for the clinic visit. Illustrating this point, UDA investigators observed that although the rate of male Veterans Affairs patients with ED listed as the primary diagnosis remained virtually constant from 2000 to 2003 (2012 per 100,000 in 2000 versus 1981 per 100,000 in 2003), the number of veterans with ED listed as any diagnosis increased by more than 2000 per 100,000 during this interval (3161 per 100,000 in 2000 versus 5236 per 100,000 in 2003).[15] Likewise, analyses of data from the Veterans Affairs Pharmacy Benefits Management Group demonstrated that the number of veterans receiving prescriptions for specific ED drugs increased ninefold from 1999 to 2003 (681 per 100,000 to 6120 per 100,000).

Before the introduction of pharmacologic therapy, penile implants were the only effective treatment for men with ED; accordingly, implants accounted for most ED-related hospitalizations and expenditures. The annual number of penile implants decreased steadily during the 1990s and 2000s, again coincident with the approval of pharmacologic ED therapies (alprostadil penile injections, alprostadil urethral suppositories, and oral sildenafil in 1994, 1996, and 1998, respectively). The mean annual implant case volume at hospitals that perform at least one implant per year decreased from 22 in 1994 to 16.1 in 2000. Not surprisingly, a corresponding trend for overall inpatient hospital stays was noted. Despite the increasing rates of ED diagnosis, the rate of inpatient hospital stays decreased from 8 per 100,000 in 1994 to 4.7 per 100,000 in 2000. This rate reached a nadir in 1998 (3.8 per 100,000), coincident with the introduction of sildenafil. Notably, admissions for penile implant surgery continue to comprise more than 80% of inpatient stays for men with a primary diagnosis of ED.[15]

Until recently, the burden of disease attributable to ED has been insufficiently quantified among nonwhite men. Fortunately, NHANES data now allow estimation of ED prevalence among racial and ethnic minorities in the United States, including Hispanic men who have been historically understudied (**Table 6**). Notably, the prevalence of ED among Hispanic men younger than 50 is roughly twice that among young non-Hispanic men (12.5% versus 4.9%). The heightened risk among Hispanics persists even after adjustment for known ED risk factors, including diabetes, obesity, and hypertension.[14] Many explanations have been suggested to explain the increased risk for ED among Hispanics.[16,17]

**Table 5**
**Female nursing home residents with admitting or current diagnosis of urinary incontinence**

| | 1995 | | 1997 | | 1999 | |
|---|---|---|---|---|---|---|
| | Count | Rate (95% CI) | Count | Rate (95% CI) | Count | Rate (95% CI) |
| Totals | 13,915 | 1237 (949–1524) | 20,679 | 1789 (1435–2143) | 15,979 | 1366 (1050–1681) |
| Age | | | | | | |
| 74 or less | 2443 | 1435 (605–2265) | 2408 | 1334 (610–2058) | 2827 | 1389 (588–2190) |
| 75–84 | 4159 | 1131 (662–1601) | 9029 | 2428 (1679–3176) | 5668 | 1540 (972–2107) |
| 85 or more | 7313 | 1245 (848–1644) | 9242 | 1531 (1085–1978) | 7685 | 1254 (823–1685) |
| Race | | | | | | |
| White | 13,397 | 1340 (1022–1558) | 17,962 | 1779 (1403–2155) | 15,075 | 1509 (1148–1869) |
| Other | 518 | 421 (0–905) | 2717 | 1969 (858–3080) | 904 | 554 (58–1051) |

Rate per 100,000 nursing home residents in same demographic stratum.
*Data from* Wessells H, Joyce GF, Wise M, et al. Erectile dysfunction. J Urol 2007;177:1675–81.

**Table 6**
**NHANES erectile dysfunction question by race and ethnicity**

| Race and Ethnicity | No. Subjects | % Subjects (95% CI) |
|---|---|---|
| White (non-Hispanic) | | |
| Always/almost always able | 42,166,116 | 65.8 (61.2–70.3) |
| Usually able | 9,720,185 | 15.2 (12.5–17.8) |
| Sometimes able | 7,719,574 | 12 (10.6–13.5) |
| Never able | 4,513,273 | 7 (5.0–9.0) |
| Mexican American | | |
| Always/almost always able | 4,254,622 | 64.2 (59.6–68.8) |
| Usually able | 1,331,461 | 20.1 (15.3–24.9) |
| Sometimes able | 668,185 | 10.1 (7.4–12.7) |
| Never able | 374,352 | 5.6 (3.9–7.4) |
| African American (non-Hispanic) | | |
| Always/almost always able | 5,320,404 | 61.5 (56.5–66.5) |
| Usually able | 1,930,336 | 22.3 (19.5–25.1) |
| Sometimes able | 1,092,557 | 12.6 (9.4–15.9) |
| Never able | 307,653 | 3.6 (1.3–5.8) |
| Other Hispanic | | |
| Always/almost always able | 3,019,237 | 63.9 (52.3–75.4) |
| Usually able | 657,696 | 13.9 (0.6–27.3) |
| Sometimes able | 882,115 | 18.7 (2.7–34.6) |
| Never able | 166,660 | 3.5 (0.7–6.4) |
| Other or multiracial | | |
| Always/almost always able | 1,766,502 | 62.9 (49.8–76.1) |
| Usually able | 727,977 | 25.9 (12.8–39.1) |
| Sometimes able | 289,029 | 10.3 (3.3–17.3) |
| Never able | 23,673 | 0.8 (0–2.7) |

Based on the question, "How would you describe your ability to get and keep an erection adequate for satisfactory intercourse?" Percentages may not total 100 because of rounding.

*Data from* Low WY, Wong YL, Zulkifli SN, et al. Malaysian cultural differences in knowledge, attitudes and practices related to erectile dysfunction: focus group discussions. Int J Impot Res 2002;14:440–5.

## UROLOGIC CANCERS

### *Prostate Cancer*

Prostate cancer and its treatments are costly and significantly impact quantity and quality of life. Accordingly, recent UDA analyses quantified trends in disease incidence, presentation, and survival, and examined relevant patterns of health care resource use.

Data from the National Cancer Institute's Surveillance, Epidemiology, and End Results (SEER) program demonstrate that prostate cancer incidence rates peaked in 1992 at 237 per 100,000 (age adjusted, all races and ages); declined steeply until 1995; and then increased at approximately 1.7% per year through 2000. In 2000, 2001, and 2002 the annual age-adjusted incidence rates were 180, 181, and 176 per 100,000, respectively. Most authorities agree that these results reflect the introduction and proliferation of prostate-specific antigen screening, which began in the late 1980s and early 1990s.

Stage at diagnosis among men with incident prostate cancer has also shifted dramatically during the last 20 years. From 1973 to 1979 and 1985 to 1989, 73% of prostate cancer diagnoses were localized or regional. In contrast, during 1995 and 2001, 91% of diagnoses were localized or regional. Across the same three intervals the percentage with distant disease at diagnosis decreased from 20% to 16% to 5%, respectively.[18]

Finally, survival rates have evolved during the last several decades. For instance, in 1973, 63% and 55% of white and black men, respectively, diagnosed with prostate cancer survived 5 years.

By 1981, the corresponding survival rates had increased to approximately 75% and 65%, respectively, for white and African American men, and for 1995 to 2000, 5-year survival improved again to 100% and 96%, respectively, for white and African American men. Nearly all men now diagnosed with local or regional prostate cancer can expect to survive at least 5 (and usually many more) years after diagnosis.[18]

With respect to resource use, estimates from Medicare suggest that in 1992 almost 86,000 men greater than or equal to 65 years old were hospitalized with a primary diagnosis of prostate cancer. In contrast, fewer than 36,000 men in this demographic group had prostate cancer–related hospitalizations in 2001. The age-adjusted rate of inpatient stays declined from 729 to 309 per 100,000 between 1992 and 2001. Rates of inpatient hospitalization for African Americans exceeded those for whites at all time points, likely reflecting the increasing incidence of the disease in this racial group.[18]

Geographic variations in hospitalization rates exist among Medicare beneficiaries with prostate cancer. Although inpatient hospitalizations decreased for all geographic regions between 1992 and 2001, the most precipitous decline occurred in the Western and Northeastern United States. An explanation for this observed trend is corresponding variability in screening and treatment practices during this time. Notably, from 1994 through 2000 hospitalization rates for prostate cancer in rural regions were less than half the rates in urban areas.

The observed changes in inpatient prostate cancer care are related, at least in part, to radical prostatectomy use rates. Hospitalization rates for radical prostatectomy remained stable between 1994 and 1996 at 127 per 100,000 in men older than 40 years before decreasing to 99 per 100,000 in 1998 and then rising again to 108 per 100,000 in 2000. During this period, radical prostatectomy rates increased among younger men (40–54 years) and declined among men greater than or equal to 65 years.[18]

Most prostate cancer survivors receive a significant portion of their care as outpatients. NAMCS data indicate that the annual age-adjusted rate of physician office visits for prostate cancer in 1992 to 2000 was 5001 per 100,000 American men older than 40 years (**Table 7**). During this period, men 75 to 84 years old had the highest rate of office visits (112,069 per 100,000) compared with men 65 to 74 years old (54,445 per 100,000) and those 40 to 64 years old (5930 per 100,000). Older patients are less likely to undergo aggressive therapy for localized disease and more likely to elect conservative management. They may also be more likely to have regular visits for therapeutic hormonal injections, consequently increasing their use of outpatient care.[18]

### *Bladder Cancer*

Bladder cancer represents the fourth most common cancer among Americans.[19] **Table 8** presents the estimated number of incident cases annually by age and year. Overall survival among patients with bladder cancer improved progressively during the last four decades, and currently 5-year survival is estimated at 82% for all stages combined.

During the last decade, the frequency of inpatient hospitalizations for bladder cancer has decreased in Medicare and non-Medicare populations. The rate of inpatient hospitalization for a bladder cancer diagnosis was highest among older patients (80–89 years) and those living in the Northeast. The rate of inpatient hospitalization was also higher in urban than in rural care settings.[20]

Contrasting with this declining use of inpatient care, outpatient visits and ambulatory surgical interventions among patients with bladder cancer have increased. Nationwide, patients of all ages with bladder cancer made 764,267 visits to physicians' offices in 2000, and Medicare beneficiaries alone made 368,200 office visits in 2001. Most of these visits (68%) were to urologists. The overall rate of ambulatory surgery visits by Medicare patients increased globally and among individual race and ethnicity strata. Bladder cancer–related hospital outpatient visits among Medicare beneficiaries increased from 1992 to 1995 before declining.[20]

Patients with SEER stage I (superficial) tumors are responsible for the largest proportion of office visits within the first 12 months following a bladder cancer diagnosis. Significantly, however, visit rates increase in parallel with disease stage.[20] Among patients with a bladder cancer–related office visit within 12 months of diagnosis 92%, 8%, and 18% saw a urologist, medical oncologist, or internist, respectively. The proportion of patients visiting a medical oncologist increased with higher disease stage. Only 36% of patients with SEER stage IV (distant) disease, however, had documented medical oncology visits. Even if it is assumed that visits to internists and physicians of unlisted specialty represent medical oncologist visits, a substantial fraction of patients with SEER stages III (regional) and IV disease did not consult with a physician capable of administering systemic chemotherapy.

**Table 7**
**Physician office visits for prostate cancer listed as primary diagnosis, 1992–2000**

| | Count | 5-y Rate (95% CI)[a] | Average Annualized Rate Per Year | 5-y Age-Adjusted Rate[b] |
|---|---|---|---|---|
| Totals[c] | 12,236,564 | 25,004 (22,810–27,198) | 5001 | 25,034 |
| Age | | | | |
| 40–64 | 2,118,240 | 5930 (4647–7212) | 1186 | — |
| 65–74 | 4,399,702 | 54,445 (46,664–62,226) | 10,889 | — |
| 75–84 | 4,739,092 | 112,069 (95,718–128,421) | 22,414 | — |
| 85+ | 979,530 | 108,031 (79,820–136,242) | 21,606 | — |
| Race and ethnicity | | | | |
| White | 10,498,163 | 26,644 (24,119–29,170) | 5329 | 25,313 |
| Other | 1,738,401 | 18,227 (14,001–22,452) | 3645 | 23,366 |
| Region | | | | |
| Midwest | 2,906,931 | 25,262 (20,840–29,683) | 5052 | 25,086 |
| Northeast | 3,718,177 | 37,425 (31,362–43,488) | 7485 | 36,556 |
| South | 3,187,693 | 18,669 (15,599–21,740) | 3734 | 18,435 |
| West | 2,423,763 | 23,256 (18,398–28,114) | 4651 | 24,738 |
| Metropolitan statistical area (MSA) | | | | |
| MSA | 10,498,173 | 28,760 (25,998–31,522) | 5752 | 28,935 |
| Non-MSA | 1,738,391 | 13,979 (11,014–16,943) | 2796 | 13,835 |

[a] Rate per 100,000 is based on 1992, 1994, 1996, 1998, and 2000 population estimates from Current Population Survey and Utilities, Unicon Research Corporation, for relevant demographic categories of United States male civilian noninstitutionalized population.
[b] Grouped years age adjusted to the US Census derived age distribution of the midpoint of years; individual years age adjusted to the US Census derived age distribution of the year under analysis.
[c] Includes persons of missing or unavailable race and ethnicity, and missing MSA.
*Data from* Konety BR, Joyce GF, Wise M. Bladder and upper tract urothelial cancer. J Urol 2007;177:1636–45.

Not surprisingly, most patients undergo transurethral resection following the initial diagnosis of bladder cancer. The average annualized rate of transurethral resection of bladder tumor in Medicare patients with a bladder cancer diagnosis is 51% and is generally consistent across genders, geographic regions, and racial and ethnic groups. The annualized rate of transurethral resection of bladder tumor does vary by age, ranging from 46% among 65- to 69-year-old Medicare beneficiaries to 60% among 90 to 94 year olds.[20]

Cystectomy rates in patients with newly diagnosed bladder cancer remained generally stable (67–91 per 1000 per year) from 1990 to 1999. The cystectomy rate is age-sensitive, however, with less-frequent use of radical surgery among patients older than age 80. According to SEER data, the highest rates of radical surgery are among patients

**Table 8**
**Estimated new bladder cancer cases in the United States**

| | Total No. (%) | No. Male (%) | No. Female (%) |
|---|---|---|---|
| 1996 | 52,900 (3.9) | 38,300 (5) | 14,600 (2.5) |
| 1998 | 54,400 (4.4) | 39,500 (6.3) | 14,900 (2.5) |
| 2000 | 53,200 (4.4) | 38,300 (6.2) | 14,900 (2.5) |
| 2002 | 56,500 (4.4) | 41,500 (6.5) | 15,000 (2.3) |
| 2004 | 60,240 (4.4) | 44,640 (6.4) | 15,600 (2.3) |

*Data from* Cancer Statistics, American Cancer Society Surveillance Research.

with stages III and IV cancers.[20] This finding reflects the preferential use of pathologic (rather than clinical) stage in SEER registry data.

Despite evidence supporting advantageous outcomes among patients undergoing continent urinary diversion at the time of radical cystectomy, UDA analyses of Medicare beneficiaries did not identify an appreciable increase in the use of continent reconstructive procedures during the last decade. The likelihood of receiving a continent diversion seems to be inversely associated with age, African American race, and burden of comorbidity, and directly associated with male gender, higher education level, and more recent year of surgery. Moreover, provider level factors are important determinants of the selection of reconstructive technique. Specifically, treatment at academic and National Cancer Institute–designated cancer centers and by high-volume providers is associated with more frequent use of continent reconstruction (**Table 9**).[21]

## PEDIATRIC UROLOGIC CONDITIONS

### *Hypospadias*

Hypospadias is a common congenital anomaly cared for by pediatric and general urologists in the United States. Historical estimates suggest that hypospadias is present in 0.3% of male newborns,[22] although more recent data suggest an increase in incidence to 0.8%[23] of white and 0.4%[24] of nonwhite male newborns. Moreover, surveillance data from the United States indicate a near doubling of the hypospadias incidence rate from 1968 through 1993, with an overall annual rate of increase of 1.4%. During this period, analyses identified 2.9% and 5.7% annual increases among white and nonwhite male newborns, respectively.[24]

Despite its rising incidence, the annual number of hypospadias-related hospitalizations decreased by 75% between 1994 (2669 hospitalizations, 2.2 per 100,000 children) and 2000 (849 hospitalizations, 0.6 per 100,000 children), with most occurring among children 0 to 2 years old (**Table 10**). Specifically, the likelihood of being hospitalized for hypospadias is 10 times greater for children younger than 3 years than for those 3 to 10 years old.[25] This observation is consistent with the common practice of performing surgical hypospadias repair in younger children, often during the first year of life.

Despite the trend toward early surgical repair, older children are often hospitalized for treatment of hypospadias-related complications rather than primary repair. Alternatively, some cases may represent late referrals of uncorrected hypospadias. In 2000, the proportion of hospitalizations for hypospadias among children older than 3 years increased to 28%.[25] This paradoxical observation may reflect a broader trend (not captured by an inpatient database) toward ambulatory hypospadias repair in infants.

Although hospitalization may be necessary following surgical intervention, most care for children with hypospadias is delivered in the outpatient setting. For commercially insured boys younger than age 3, the rate of hypospadias-related ambulatory surgery increased 1.5-fold from 1994 (321 per 100,000) to 2002 (468 per 100,000). For the same population, physician office visits for hypospadias increased concurrently from 429 per 100,000 in 1994 to 655 per 100,000 in 2002. According to data from the National Survey of Ambulatory Surgery, more than 39,000 visits to ambulatory surgery centers for hypospadias repair occurred between 1994 and 1996. Two thirds of these were infant visits. Children in the Northeast and Midwest were more likely to have an ambulatory surgery visit for hypospadias repair than those in the South or West.[25]

### *Undescended Testis*

Also known as ''cryptorchidism,'' undescended testis affects 3% of full-term male newborns and is the most common male genital anomaly identified at birth. The evaluation and surgical treatment for undescended testis occur almost exclusively in the outpatient setting. Between 1992 and 2000 there were 611,647 physician office visits (96 per 100,000 in each year) for undescended testis listed as the primary diagnosis, and most patients were younger than 18 years.[25] National Survey of Ambulatory Surgery data indicate a constant annualized rate of undescended testis–related surgeries (ie, orchiopexy) at about 18 per 100,000 in 1994 to 1996. Although rates of orchiopexy are highest among children 0 to 2 years old (the recommended age range for surgical correction), a substantial minority of procedures were performed in children 3 to 10 years old, suggesting a delay in either diagnosis or intervention. Geographic variation was also noted, with higher ambulatory surgery rates in the Northeast and Midwest than in the South and West.[25]

### *Vesicoureteral Reflux*

The overall incidence of vesicoureteral reflux in the pediatric population is estimated to be 10%. The prevalence is often reported, however, and varies by mode of presentation (eg, prenatally or among children with prior urinary tract infection).[26] Accordingly, reflux occurs in 17.2% of children

**Table 9**
**Multivariate analysis of factors associated with continent reconstruction**

| Characteristic | Odds Ratio (95% CI) |
|---|---|
| Age (versus 65–69) | |
| 70–74 | 0.68 (0.54–0.87) |
| 75–79 | 0.43 (0.33–0.55) |
| At least 80 | 0.19 (0.13–0.27) |
| Male | 1.45 (1.15–1.84) |
| Race and ethnicity (versus white) | |
| African American | 0.43 (0.25–0.76) |
| Hispanic | 0.92 (0.55–1.53) |
| Other | 1.09 (0.66–1.80) |
| Married (versus not married) | 1.13 (0.90–1.41) |
| Median income (versus $\geq$$75,000)[a] | |
| Less than $20,000 | 0.70 (0.16–3.07) |
| $20,000–$49,999 | 1.22 (0.81–1.84) |
| $50,000–$74,000 | 1.43 (1.01–2.01) |
| College educated (versus less than 25%)[a] | |
| 25%–40% | 1.14 (0.81–1.61) |
| At least 40% | 1.54 (1.06–2.23) |
| Charlson score (versus 0) | |
| 1–2 | 0.97 (0.79–1.19) |
| 3+ | 0.71 (0.51–0.97) |
| SEER registry (versus Los Angeles) | |
| San Francisco | 0.38 (0.26–0.56) |
| Connecticut | 0.15 (0.11–0.22) |
| Detroit | 0.16 (0.11–0.24) |
| Hawaii | 0.10 (0.03–0.29) |
| Iowa | 0.11 (0.07–0.17) |
| New Mexico | 0.39 (0.23–0.66) |
| Seattle | 1.22 (0.88–1.68) |
| Utah | 0.22 (0.12–0.40) |
| Atlanta | 1.17 (0.74–1.86) |
| San Jose | 0.74 (0.48–1.13) |
| Surgery year (versus 1992–1994) | |
| 1995–1997 | 1.56 (1.23–1.97) |
| 1998–2000 | 1.98 (1.53–2.54) |
| Stage at least III (versus I) | 0.85 (0.70–1.03) |
| Lymph nodes negative | 1.04 (0.84–1.28) |
| *Hospital type* | |
| Academic | 1.43 (1.14–1.81) |
| National Cancer Institute cancer center | 5.50 (4.20–7.22) |
| High-volume hospital (versus low) | 1.49 (1.19–1.86) |

[a] Based on median income and percent college educated in subject's ZIP code.
*Data from* SEER-Medicare.

**Table 10**
**Inpatient hospital stays for hypospadias listed as primary diagnosis in 1997 and 2000**

| | 1997 | | | | 2000 | | |
|---|---|---|---|---|---|---|---|
| | Count[a] | Rate (95% CI)[b] | Age-Adjusted Rate[c] | % All Hospitalizations | Count[a] | Rate (95% CI)[b] | % All Hospitalizations |
| Total[d] | 1889 | 5.2 (3.6–6.7) | 5.1 | 0.06 | 1385 | 3.7 (2.5–5.0) | 0.04 |
| Age | | | | | | | |
| <3 | 1421 | 24 (16–31) | — | 0.06 | 993 | 17 (11–22) | 0.04 |
| 3–10 | 385 | 2.3 (1.6–3.1) | — | 0.10 | 277 | 1.6 (0.9–2.4) | 0.09 |
| 11–17 | 82 | 0.6 (0.3–0.9) | — | 0.02 | 114 | 0.8 (0.4–1.1) | 0.03 |
| Race and ethnicity[e] | | | | | | | |
| White | 954 | 4 (2.7–5.4) | 4.1 | 0.07 | 643 | 2.8 (1.8–3.7) | 0.04 |
| Black | 169 | 3 (1.5–4.5) | 3.1 | 0.04 | 132 | 2.3 (1.4–3.3) | 0.03 |
| Hispanic | 274 | — | 4.2 | 0.07 | 200 | — | 0.04 |
| Region | | | | | | | |
| Midwest | 149 | 1.7 (0.9–2.6) | 1.6 | 0.02 | 140 | — | 0.02 |
| Northeast | 706 | 10 (5.6–15) | 11 | 0.11 | 463 | 7 (3.5–10) | 0.08 |
| South | 388 | — | 3.1 | 0.03 | 282 | 2.2 (1.0–3.5) | 0.02 |
| West | 646 | — | 7.2 | 0.08 | 499 | — | 0.06 |
| Metropolitan statistical area (MSA) | | | | | | | |
| Rural | 44 | — | — | 0.01 | 25 | — | 0.01 |
| Urban | 1845 | 6.6 (4.6–8.5) | 6.3 | 0.07 | 1357 | 4.7 (3.1–6.2) | 0.05 |

No value indicates that it did not meet standard for reliability or precision.
[a] Counts may not total because of rounding.
[b] Rate per 100,000 is based on 1997 population estimates from Current Population Survey and Utilities, Unicon Research Corporation, for relevant demographic categories of United States male civilian noninstitutional population under age 18.
[c] Age adjusted to 2000 US Census.
[d] Persons of other races, missing race and ethnicity, and missing MSA are included in the totals.
[e] Race and ethnicity breakdown not included because of large percent of missing values in 1997.
*Data from* HCUP Kids' Inpatient Database.

without prior urinary tract infection, in 40% to 70% with a history of urinary tract infection, and in up to 37% with prenatally detected hydronephrosis.[27]

An underlying diagnosis of reflux is more common among boys than girls with prenatal hydronephrosis. In contrast, in the setting of a diagnostic evaluation after urinary tract infection, reflux is more frequently detected among girls. The prevalence of reflux in African American children with urinary tract infection is less than that in white children up to age 10.[28] Once reflux is discovered, however, its grade and chance of spontaneous resolution are similar for girls of both races.[29]

Among children younger than 18, the annual reflux-related inpatient hospitalization rate was stable between 1994 and 2000 at 6.4 to 7 per 100,000 children. This trend was true for girls and boys, with the girl/boy ratio remaining relatively constant at 3:1. Inpatient hospitalizations are more common among white children. Regionally, the rates have been relatively constant.[30]

NAMCS data indicate that during 5 years sampled between 1992 and 2000, 418,954 office visits (32 per 100,000 in each year) specified reflux as the primary diagnosis. The rates of visits to physician offices doubled between 1994 and 2002 from 12 to 26 per 100,000 for commercially insured children and from 43 to 85 per 100,000 for children covered by Medicaid. This difference is unlikely to be explained fully by a greater severity of vesicoureteral reflux among Medicaid participants. Rather, socioeconomic factors may concurrently influence the frequency of office visits and the occurrence of reflux-related complications. Among commercially insured children, the gender ratio of outpatient visits has been constant over time, and little geographic variation in patterns of ambulatory care has been noted. Overall, the rate of reflux-related ambulatory surgery visits by commercially insured children increased from 3.4 per 100,000 in 1998 to 4.8 per 100,000 in 2002. This may reflect increased use of Deflux

implantation in lieu of open surgical correction or more repeat Deflux procedures.[30]

## SUMMARY

The burden of urologic disease on the American public by any measure is immense. It is shifting and deserves ongoing attention as a topic of clinical investigation, epidemiologic analyses, and health services research. UDA analyses have leveraged existing national data sets to identify opportunities to improve the quality of care and reduce disparities in care. Documenting emerging and evolving trends in epidemiology, practice patterns, resource use, technology diffusion, and costs for urologic disease has broad implications for quality, access to care, and the equitable allocation of scarce resources in terms of medical services and research budgets. The UDA project represents a major step toward accomplishing these goals. Further details on the methods and results, and free, downloadable UDA chapters, are publicly available at www.uda.niddk.nih.gov and www.udaonline.net.

## REFERENCES


1. Litwin MS, Saigal CS, editors. Urologic diseases in America. NIH Publication No. 07–5512. Washington, DC: U.S. Department of Health and Human Services, Public Health Service, National Institutes of Health, National Institute of Diabetes and Digestive and Kidney Diseases, U.S. Government Publishing Office; 2007.
2. Wei JT, Calhoun E, Jacobsen SJ. Urologic diseases in America Project: benign prostatic hyperplasia. J Urol 2005;173(4):1256–61.
3. Gee WF, Holtgrewe HL, Blute ML, et al. 1997 American Urological Association Gallup survey: changes in diagnosis and management of prostate cancer and benign prostatic hyperplasia, and other practice trends from 1994 to 1997. J Urol 1998;160(5): 1804–7.
4. McConnell JD, Roehrborn CG, Bautista OM, et al. The long-term effect of doxazosin, finasteride, and combination therapy on the clinical progression of benign prostatic hyperplasia. N Engl J Med 2003; 349(25):2387–98.
5. Thom DH, Nygaard IE, Calhoun EA. Urologic Diseases in America Project: urinary incontinence in women-national trends in hospitalizations, office visits, treatment and economic impact. J Urol 2005;173(4):1295–301.
6. Nygaard I, Turvey C, Burns TL, et al. Urinary incontinence and depression in middle-aged United States women. Obstet Gynecol 2003;101(1):149–56.
7. Sampselle CM, Harlow SD, Skurnick J, et al. Urinary incontinence predictors and life impact in ethnically diverse perimenopausal women. Obstet Gynecol 2002;100(6):1230–8.
8. Olsen AL, Smith VJ, Bergstrom JO, et al. Epidemiology of surgically managed pelvic organ prolapse and urinary incontinence. Obstet Gynecol 1997; 89(4):501–6.
9. Waetjen LE, Subak LL, Shen H, et al. Stress urinary incontinence surgery in the United States. Obstet Gynecol 2003;101(4):671–6.
10. Leach GE, Dmochowski RR, Appell RA, et al. Female stress urinary incontinence clinical guidelines panel summary report on surgical management of female stress urinary incontinence. The American Urological Association. J Urol 1997; 158(3 Pt 1):875–80.
11. Nygaard I, Thom D, Calhoun E. Urinary incontinence in women. In: Litwin MS, Saigal CS, editors. Urologic Diseases in America. NIH Publication No. 07-5512. Washington, DC: U.S. Department of Health and Human Services, Public Health Service, National Institutes of Health, National Institute of Diabetes and Digestive and Kidney Diseases, U.S. Government Publishing Office; 2007. p. 157–91.
12. Coward RT, Horne C, Peek CW. Predicting nursing home admissions among incontinent older adults: a comparison of residential differences across six years. Gerontologist 1995;35(6):732–43.
13. Anger JT, Saigal CS, Pace J, et al. True prevalence of urinary incontinence among female nursing home residents. Urology 2006;67(2):281–7.
14. Saigal CS, Wessells H, Pace J, et al. Predictors and prevalence of erectile dysfunction in a racially diverse population. Arch Intern Med 2006;166(2):207–12.
15. Wessells H, Joyce GF, Wise M, et al. Erectile dysfunction. J Urol 2007;177(5):1675–81.
16. Low WY, Wong YL, Zulkifli SN, et al. Malaysian cultural differences in knowledge, attitudes and practices related to erectile dysfunction: focus group discussions. Int J Impot Res 2002;14(6):440–5.
17. Rosas-Vargas H, Coral-Vazquez RM, Tapia R, et al. Glu298Asp endothelial nitric oxide synthase polymorphism is a risk factor for erectile dysfunction in the Mexican Mestizo population. J Androl 2004; 25(5):728–32.
18. Penson DF, Chan JM. Prostate cancer. J Urol 2007; 177(6):2020–9.
19. Jemal A, Siegel R, Ward E, et al. Cancer statistics 2007. CA Cancer J Clin 2007;57(1):43–66.
20. Konety BR, Joyce GF, Wise M. Bladder and upper tract urothelial cancer. J Urol 2007;177(5):1636–45.
21. Gore JL, Saigal CS, Hanley JM, et al. Variations in reconstruction after radical cystectomy. Cancer 2006;107(4):729–37.
22. Borer JG, Bauer SB, Peters CA, et al. Tubularized incised plate urethroplasty: expanded use in primary and repeat surgery for hypospadias. J Urol 2001;165(2):581–5.

23. Silver RI. What is the etiology of hypospadias? A review of recent research. Del Med J 2000;72(8):343–7.
24. Paulozzi LJ, Erickson JD, Jackson RJ. Hypospadias trends in two US surveillance systems. Pediatrics 1997;100(5):831–4.
25. Pohl HG, Joyce GF, Wise M, et al. Cryptorchidism and hypospadias. J Urol 2007;177(5):1646–51.
26. Sargent MA. What is the normal prevalence of vesicoureteral reflux? Pediatr Radiol 2000;30(9): 587–93.
27. Smellie JM, Normand IC. Clinical features and significance of urinary tract infection in children. Proc R Soc Med 1966;59(5):415–6.
28. Askari A, Belman AB. Vesicoureteral reflux in black girls. J Urol 1982;127(4):747–8.
29. McLorie GA, McKenna PH, Jumper BM, et al. High grade vesicoureteral reflux: analysis of observational therapy. J Urol 1990;144(2 Pt 2):537–40 [discussion: 545].
30. Pohl HG, Joyce GF, Wise M, et al. Vesicoureteral reflux and ureteroceles. J Urol 2007;177(5):1659–66.