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The demographic burden of urologic diseases in America

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The Urologic Diseases in America project

The National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK) initiated the Urologic Diseases in America (UDA)¹ project in 2001 with the goal of quantifying the immense demographic burden of urological diseases on the American public, in both human and financial terms (Table 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 urological 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 urological diseases is often substantial for patients and families, employers, payers and society at large (Tables 2 and 3). Moreover, physician practice and patient care-seeking behavior in urology have changed dramatically in response to a variety of financial and non-financial incentives in recent years. A thoughtful policy response to these changes requires a thorough understanding of the health care resource utilization and clinical epidemiology relevant to urological 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 urological 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 utilization, 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 urological diseases, were prodigiously tapped for

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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 review details major initial findings from the UDA project with respect to the demographic impact of the most common benign, malignant and pediatric urologic conditions.

Benign urologic conditions

Benign prostatic hyperplasia (BPH)

BPH, a chronic and often progressive condition, affects nearly 3 in 4 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 (NHAMCS), we observed 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 (Table 4). 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 alpha-blockers and/or 5-alpha-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 alpha-blockers, doxazosin and tamsulosin. That year, only 7.3% of BPH-related outpatient visits culminated in a prescription for the 5-alpha-reductase inhibitor, finasteride. The widespread use of these pharmacological agents is supported by a broad clinical literature including the landmark NIDDK-funded Medical Therapy of Prostatic Symptoms (MTOPS) study, which demonstrated that combination therapy (alpha-blocker and 5-alpha 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 Healthcare Cost and Utilization Project (HCUP), 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 (UI) in women

Because women may be reluctant to discuss incontinence 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 urinary incontinence among American females.

Analyses of population-based data from the National Health and Nutrition Examination Survey (NHANES) estimated a 38% prevalence of UI among women ≥ 60 years old surveyed in 1999–2000. When stratified by frequency of episodes, 13.7% of all women in NHANES reported daily incontinence, while an additional 10.3% reported weekly incontinence. The prevalence of daily incontinence increased with age, ranging from 12.2% in all women 60–64 years old to 19.4% in those ≥ 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 5). 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, the majority 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 (108/100,000) 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 1,845 per 100,000 in 2000. Similarly, visits for which UI was the primary diagnosis increased from 468 per 100,000 in 1992 to 1,107 per 100,000 in 2000.⁵ Office visits for incontinence by female Medicare beneficiaries (≥ 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 74–114 per 100,000 women in the Northeast United States to 217–306 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 (2,776 per 100,000). Although still common, the number of anterior urethropexies decreased between 1992 (3,941 per 100,000) and 1998 (2,364 per 100,000). During the same interval,

nationwide utilization 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 $\leq$ age 65, the rate of ambulatory surgery visits for UI increased from 15 per 100,000 in 1994 to 34 per 100,000 in 2000. Likewise, the rate of ambulatory surgical center visits by older ($\geq$ 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 1–2% have a diagnosis of incontinence.¹¹

However, clinical studies reveal that a much larger proportion actually has UI at nursing home admission.¹² To explore this difference, UDA researchers used data from the National Nursing Home Survey (NNHS) 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 73.8–85.4% were identified by the NNHS as having difficulty controlling urination, and 9.5–11.7% 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) 56.3–58.6% 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 $\geq$ 85 years old, 31.5% were 75–84 years old, and 17.8% were $\leq$ 74 years old (Table 6). In contrast, 41.5% of those without incontinence were $\geq$ 85 years old, 32.2% were 75–84 years old, and 26.2% $\leq$ 74 years old. Race/ethnicity did not differ between the incontinent and continent nursing home residents (Table 6).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 and/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 urinary incontinence.

Erectile dysfunction (ED)

According to 2001–02 population-based NHANES data, nearly 1 in 5 men experience erectile dysfunction, 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 US demonstrates a monotonous increase with advancing age, as 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 utilization, 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 (1,609 per 100,000)

and 1998 (3,387 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/ethnic and geographic strata. The rising utilization 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 HCUP 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 physiological 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 (2,012 per 100,000 in 2000 vs 1,981 per 100,000 in 2003), the number of veterans with ED listed as any diagnosis increased by more than 2,000 per 100,000 during this interval (3,161 per 100,000 in 2000 vs 5,236 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 9-fold from 1999 to 2003 (681 per 100,000 to 6,120 per 100,000).

Before the introduction of pharmacologic therapy, penile implants were the only effective treatment for men with ED; accordingly, implants accounted for the majority of ED-related hospitalizations and expenditures. The annual number of penile implants decreased steadily during the 1990s and 2000s, again coincident with the approval of pharmacological 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 1 implant per year decreased from 22.0 in 1994 to 16.1 in 2000. Not surprisingly, we noted a corresponding trend for overall inpatient hospital stays. Despite the increasing rates of ED diagnosis, the rate of inpatient hospital stays decreased from 8.0 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 non-white men. Fortunately, NHANES data now allow estimation of ED prevalence among racial and ethnic minorities in the US, including Hispanic men who have been historically under-studied (Table 7). Notably, the prevalence of ED among Hispanic men younger than 50 is roughly twice that among young non-Hispanic men (12.5% vs 4.9%). In fact, 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}

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 utilization.

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 (PSA) 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 3 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/regional prostate cancer can expect to survive at least 5 (and usually many more) years after diagnosis.¹⁸

With respect to resource utilization, estimates from Medicare suggest that in 1992 almost 86,000 men ≥ 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 utilization 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 in to 108 per 100,000 in 2000. During this period, radical prostatectomy rates increased among younger men (40–54 years) and declined among men ≥ 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 1992–2000 was 5,001 per 100,000 American males older than 40 years (Table 8). During this period, men 75–84 years old had the highest rate of office visits (112,069 per 100,000) compared with men 65–74 years old (54,445 per 100,000) and those 40–64 years old (5,930 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 utilization of outpatient care.¹⁸

Bladder cancer

Bladder cancer represents the fourth most common cancer among Americans.¹⁹ Table 9 presents the estimated number of incident cases annually by age and year. Overall survival among patients with bladder cancer improved progressively during the last 4 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 utilization 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. A majority of these visits (68%) were to urologists. The overall rate of ambulatory surgery visits by Medicare patients increased globally and among individual race/ethnic 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 and/or internist, respectively. The proportion of patients visiting a medical oncologist increased with higher disease stage. However, only 36% of patients with SEER stage IV (distant) disease 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.

Not surprisingly, a majority of 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 race/ethnic groups. The annualized rate of transurethral resection of bladder tumor does vary by age, ranging from 46% among 65–69-year-old Medicare beneficiaries to 60% among 90–94-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. However, the cystectomy rate is age-sensitive, with less-frequent use of radical surgery among patients older than 80. According to SEER data, the highest rates of radical surgery are among patients with stages III and IV cancers.²⁰ This finding reflects the preferential use of pathological (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 appears to be inversely associated with age, African American race and burden of comorbidity, and directly associated with male sex, 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 10).²¹

Pediatric urologic conditions

Hypospadias

Hypospadias is a common congenital anomaly cared for by pediatric and general urologists in the US. 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 non-white male newborns. Moreover, surveillance data from the US 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 non-white male newborns, respectively.²⁴

Despite its rising incidence, the annual number of hypospadias-related hospitalizations decreased by 75% between 1994 (2,669 hospitalizations, 2.2 per 100,000 children) and 2000 (849 hospitalizations, 0.6 per 100,000 children), with the majority occurring among children 0 to 2 years old (Table 11). Specifically, the likelihood of being hospitalized for hypospadias is 10 times greater for children younger than 3 years than for those 3–10 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 (UDT)

Also known as cryptorchidism, UDT affects 3% of full-term male newborns and is the most common male genital anomaly identified at birth. The evaluation and surgical treatment for UDT 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 UDT listed as the primary diagnosis, and the overwhelming majority of patients were younger than 18 years.²⁵ National Survey of Ambulatory Surgery data indicate a constant annualized rate of UDT-related surgeries (i.e., orchiopexy) at about 18 per 100,000 in 1994–1996. Although rates of orchiopexy are highest among children 0–2 years old (the recommended age range for surgical correction), a substantial minority of procedures were performed in children 3–10 years old, suggesting a delay in either diagnosis or intervention. Geographic variation was noted as well, 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%. However, the prevalence is often reported, and varies, by mode of presentation (e.g., prenatally or among children with prior urinary tract infection).²⁶ Accordingly, reflux occurs in 17.2% of children without prior urinary tract infection, 40% to 70% with a history of urinary tract infection and 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 However, once reflux is discovered, its grade and chance of spontaneous resolution are similar for girls children of both races.²⁹

Among children younger than 18, the annual reflux related inpatient hospitalization rates was stable between 1994 and 2000 at 6.4–7.0 per 100,000 children. This trend was true for girls and boys, with the girl-to-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 VUR 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 DefluxTM implantation in lieu of open surgical correction and/or more repeat Deflux procedures.³⁰

Conclusions

The burden of urological 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. To be sure, documenting emerging and evolving trends in epidemiology, practice patterns, resource utilization, technology diffusion and costs for urological 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 Urologic Diseases in America project represents a major step toward accomplishing these goals. Further details on the methods and results, as well as free, downloadable UDA chapters, are publicly available at www.uda.niddk.nih.gov and www.udaonline.net.

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Table 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

Table 2

Burden of selected urologic diseases in America in 2000

	No. Visits to Office Based Physicians (NAMCS) + Hospital Outpatient Clinics (NHAMCS)		No. Visits to Emergency Rooms (NHAMCS)	No. Hospital Stays	Total Expenditures (million \$) *
	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	\$1,099.5
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 [‡]	2,130,929		46,470	\$452.8
Urinary incontinence in men	207,595	353,065		1,332	\$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	\$2,067.4
Kidney cancer		279,564			\$401,390,672
Pediatric urological disorders					
Vesicoureteral reflux	83,791 [‡]	140,098 [‡]			\$41,725,663
Undescended testis	148,551	215,482			\$16,563,330
Hypospadias		17,364 [‡]			\$16,803,712
Ureterocele					\$17,046,404
Male reproductive health					
Infertility		158,413 [‡]			\$327,626,849
Erectile dysfunction		2,904,896			\$191,074,350
Peyronie's disease		364,389			\$21,745,500
Urethral stricture		14,790			
Testicular cancer					
Infections					
Urinary tract infections in women	6,860,160	8,966,738	1,311,359	245,879	\$2,474.0
Urinary tract infections in men	1,409,963	2,049,232	424,705	121,367	\$1,027.9

* Based on data from National Ambulatory Medical Care Survey (NAMCS), National Hospital Ambulatory Medical Care Survey (NHAMCS), Healthcare Cost and Utilization Project (HCUP) and Medical Expenditure Panel Survey (MEPS).

[‡] Physician office visits only.

[‡] Hospital outpatient visits only

Table 3

Estimated incremental annual expenditures associated with various urological diagnoses (per individual)

Diagnosis	Individual Annual Cost (\$) *
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

* Privately insured patients 18–64 years old.

Table 4

National physician office and hospital outpatient visits for benign prostatic hyperplasia and/or lower urinary tract symptoms ¹

		Count	Rate (95% CI)
1994	Primary reason	2,899,300	6371 (5,495–7,248)
	Any reason	4,603,426	10,116 (8,826–11,406)
1996	Primary reason	3,658,367	7484 (6,294–8,675)
	Any reason	6,112,287	12,505 (10,856–14,153)
1998	Primary reason	3,990,359	7754 (6,281–9,226)
	Any reason	6,443,185	12,520 (10,531–14,508)
2000	Primary reason	4,418,425	8201 (6,765–9,637)
	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 non-institutionalized population ≥ 40 years old.

SOURCE: NAMCS and NHAMCS.

Table 5Prevalence of difficulty controlling bladder in women ⁴

	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/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/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).

SOURCE: NHANES.

Table 6 Female nursing home residents with admitting or current diagnosis of urinary incontinence 15

	1995			1997			1999		
	Count	Rate (95% CI)	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 (605-2,265)	2408	1334 (610-2,058)	2827	1389 (588-2,190)			
75-84	4159	1131 (662-1,601)	9029	2428 (1,679-3,176)	5668	1540 (972-2,107)			
85 or more	7313	1245 (848-1,644)	9242	1531 (1,085-1,978)	7685	1254 (823-1,685)			
Race:									
White	13,397	1340 (1,022-1,558)	17,962	1779 (1,403-2,155)	15,075	1509 (1,148-1,869)			
Other	518	421 (0.0-905)	2717	1969 (858-3,080)	904	554 (58-1,051)			

Rate per 100,000 nursing home residents in same demographic stratum.
SOURCE: NNHS.

Table 7NHANES erectile dysfunction question by race/ethnicity ¹⁶

Race/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	12.0 (10.6–13.5)
Never able	4,513,273	7.0 (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.

SOURCE: NHANES.

Table 8Physician office visits for prostate cancer listed as primary diagnosis 1992–2000 ²⁰

	Count	5-Yr Rate (95% CI) *	Av Annualized Rate/Yr	5-Yr Age Adjusted Rate [†]
Totals [‡]	12,236,564	25,004 (22,810–27,198)	5001	25,034
Age:				
40–64	2,118,240	5930 (4,647–7,212)	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/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
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

* 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 non-institutionalized population.

[†] Grouped years age adjusted to the U.S. Census derived age distribution of the midpoint of years; individual years age adjusted to the U.S. Census derived age distribution of the year under analysis.

[‡] Includes persons of missing or unavailable race and ethnicity, and missing MSA.

SOURCE: NAMCS.

Table 9

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)

SOURCE: Cancer Statistics, American Cancer Society Surveillance Research.

Table 10Multivariate analysis of factors associated with continent reconstruction ²³

Characteristic	Odds Ratio (95% CI)
Age (vs 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/ethnicity (vs white):	
African American	0.43 (0.25–0.76)
Hispanic	0.92 (0.55–1.53)
Other	1.09 (0.66–1.80)
Married (vs not married)	1.13 (0.90–1.41)
Median income (vs ≥\$75,000): *	
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 (vs less than 25%): *	
25%–40%	1.14 (0.81–1.61)
At least 40%	1.54 (1.06–2.23)
Charlson score (vs 0):	
1–2	0.97 (0.79–1.19)
3+	0.71 (0.51–0.97)
SEER registry (vs 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 yr (vs 1992–1994):	
1995–1997	1.56 (1.23–1.97)
1998–2000	1.98 (1.53–2.54)
Stage at least III (vs I)	0.85 (0.70–1.03)
Lymph nodes neg	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 (vs low)	1.49 (1.19–1.86)

* Based on median income and percent college educated in subject's ZIP code.

SOURCE: SEER-Medicare.

Table 11
Inpatient hospital stays for hypospadias listed as primary diagnosis in 1997 and 2000 ³¹

	1997			2000		
	Count *	Rate (95% CI) †	Age Adjusted Rate ‡	% All Hospitalizations	Count *	Rate (95% CI) †
Total §	1889	5.2 (3.6–6.7)	5.1	0.06	1385	3.7 (2.5–5.0)
Age:						
<3	1421	24 (16–31)		0.06	993	17 (11–22)
3–10	385	2.3 (1.6–3.1)		0.10	277	1.6 (0.9–2.4)
11–17	82	0.6 (0.3–0.9)		0.02	114	0.8 (0.4–1.1)
Race/ethnicity: ¶						
White	954	4.0 (2.7–5.4)	4.1	0.07	643	2.8 (1.8–3.7)
Black	169	3.0 (1.5–4.5)	3.1	0.04	132	2.3 (1.4–3.3)
Hispanic	274		4.2	0.07	200	
Region:						
Midwest	149	1.7 (0.9–2.6)	1.6	0.02	140	
Northeast	706	10 (5.6–15)	11.0	0.11	463	7.0 (3.5–10)
South	388		3.1	0.03	282	2.2 (1.0–3.5)
West	646		7.2	0.08	499	
MSA:						
Rural	44			0.01	25	
Urban	1845	6.6 (4.6–8.5)	6.3	0.07	1357	4.7 (3.1–6.2)

No value indicates that it did not meet standard for reliability or precision.

* Counts may not total due to rounding.

† 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 non-institutional population under age 18.

‡ Age adjusted to 2000 U.S. Census.

§ Persons of other races, missing race and ethnicity, and missing MSA are included in the totals.

¶ Race/ethnicity breakdown not included because of large percent of missing values in 1997.

SOURCE: HCUP Kids' Inpatient Database.