Urologic diseases in the Islamic Republic of Iran: what are the public health priorities?

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أمراض الجهاز البولي في جمهورية إيران الإسلامية: ما هي أولويات الصحة العمومية

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الخلاصة: صُمِّمت هذه الدراسة لتقدير عبء أمراض الجهاز البولي في جمهورية إيران الإسلامية، بوصفها طريقة عملية لتحديد أولويات الصحة العمومية. وباستخدام الدلائل الإرشادية لمنظمة الصحة العالمية الخاصة بدراسات العبء الوطني للأمراض، تم إجراء الخطوات الستة الآتية: انتقاء الأمراض المدروسة؛ التصنيف الديناميكي للأمراض؛ تجميع المعطيات حول أمراض الجهاز البولي؛ احتساب وَزْنَات العجز الناجم عن أمراض الجهاز البولي؛ تحليل المعطيات باستخدام برنامج Dis Mod Π، وحساب سنوات العمر المصححة باحتساب مدد العجز DALY لكل مرض. وقد مثلت حصيات الكلى، والتهاب المثانة الحاد، والتهاب البروستاتة المزمن، وفرط تنسج البروستاتة الحميد، وعقم الذكور، والكلية المتعددة الكيسات لدى البالغين، العبء الأكبر لأمراض الجهاز البولي.

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ABSTRACT This study was designed to estimate the burden of urologic diseases in the Islamic Republic of Iran as a practical method for defining public health priorities. Using World Health Organization guidelines for national burden of disease studies, 6 steps were performed: selecting diseases to include; dynamic modelling of diseases; gathering data about urologic diseases; computing the local disability weights of urologic diseases; data analysis with *DisMod II*; and computing the disability-adjusted life years for each disease. Renal calculus, acute cystitis, chronic prostatitis, benign prostate hyperplasia, male infertility and adult polycystic kidney disease comprised the greatest burden.

Maladies urologiques en République islamique d'Iran : quelles sont les priorités en matière de santé publique ?

RÉSUMÉ Cette étude visait à estimer la charge des maladies urologiques en République islamique d'Iran afin de disposer d'une méthode pratique pour définir les priorités en matière de santé publique. Conformément aux lignes directrices de l'OMS relatives aux études sur la charge nationale de morbidité, une procédure en six étapes a été suivie : sélection des maladies à prendre en compte ; modélisation dynamique des maladies ; rassemblement de données sur les maladies urologiques ; calcul des poids de l'incapacité liée aux maladies urologiques au niveau local ; analyse des données à l'aide du logiciel *DisMod II* ; et calcul des années de vie corrigées de l'incapacité (AVCI) pour chaque maladie. Les calculs rénaux, la cystite aiguë, la prostatite chronique, l'hyperplasie bénigne de la prostate, la stérilité masculine et la polykystose rénale de l'adulte constituaient la charge la plus importante.

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Introduction

Information that accurately describes the health needs of a population is important for determining public health priorities. Mortality data have traditionally been used to assess the level of disease in a population. However, mortality figures do not capture the huge toll of sickness and disability caused by diseases that do not lead immediately to death, keeping workers away from their job and children out of school and generally slowing both economic and social development. Over the years various investigators have attempted to overcome these limitations by developing new measures for the impact of diseases on disability or quality of life in addition to mortality. One of the most recent measures is disability-adjusted life years (DALYs). Each DALY is equal to 1 year of healthy life lost.

Urological diseases encompass a diverse group of conditions that have a major impact on the health of people in the Islamic Republic of Iran. Our goal was to generate a forum for informed debates of values and priorities concerning urologic diseases, identify national priorities for urologic disease control, allocate training time for clinical and public health practitioners, define research priorities and develop resources for health interventions such as prevention programmes for urologic diseases. The present study was designed to estimate the burden of urologic diseases in the Islamic Republic of Iran as a practical method for defining the public health priorities.

Methods

The following 6 steps were completed using the World Health Organization's guidelines for national burden of disease studies [1]. There are 19 members of the National Urologic Board in the Islamic Republic of Iran. In each phase of the study, a sample of them was selected to answer our questionnaires according to their specialty and accessibility.

Selection of urologic diseases for inclusion

To select the urologic diseases to include in the study, a list of possible diseases was initially drawn up from the *International classification of diseases, 10th revision* (*ICD-10*) codes [2] and *Global burden of disease 2000* (*GBD 2000*) cause categories [3]. A questionnaire with 4 closed questions was prepared to establish if each disease is an outcome or complication of another disease; common or uncommon; detectable or undetectable; and produces a significant burden or not. The questionnaire was validated by interviewing 4 randomly selected urologists from the National Urologic Board. Then the questionnaire was sent to 10 other urologists with 10–27 years experience in urologic practice [mean 17 (standard deviation 7) years]. According to their expert opinions, we selected 22 urologic diseases. Due to the limitations of time and budget for the project, we used another questionnaire to prioritize the diseases according to their prevalence, mortality rate, disability rate and cost. This questionnaire was sent to another 10 urologists. The urologists scored each disease from 1 to 4 according to these criteria. By this process, a final group of 13 urologic diseases was selected (Table 1).

Plotting the natural history and dynamic modelling of urologic diseases

We created a diagram of the epidemiological dynamic model of urologic diseases to help us to define the epidemiological indicators. Figure 1 illustrates the model for cancer. We undertook these actions for

Table 1 **Disability weights of urologic diseases in Islamic Republic of Iran, based on data from *Global burden of disease 2000* or on data established locally by urologist consensus**

Treated form of urologic diseases	*GBD 2000* disability weights[a]	Local disability weights			
		Mean	SD	Min.	Max.
Hyperplasia of prostate	0.038	–	–	–	–
Malignant neoplasm of prostate	0.134	–	–	–	–
Malignant neoplasm of bladder	0.087	–	–	–	–
Polycystic kidney disease, adult type	–	0.063	0.013	0.04	0.08
Congenital vesicoureteral reflux	–	0.051	0.013	0.04	0.08
Male infertility	–	0.045	0.018	0.02	0.09
Hypospadias	–	0.033	0.014	0.02	0.06
Chronic prostatitis	–	0.043	0.020	0.02	0.10
Calculus of kidney	–	0.056	0.023	0.02	0.10
Calculus of ureter	–	0.053	0.033	0.01	0.11
Acute cystitis	–	0.018	0.091	0.01	0.04
Malignant neoplasm of testis	–	0.095	0.016	0.06	0.12
Malignant neoplasm of kidney, except renal pelvis	–	0.109	0.023	0.06	0.14

[a]*Source: Global burden of disease 2000 [3].*
SD = standard deviation.

each urologic disease: defining the population for which the estimates were being developed; describing case definitions and relationships between the diseases; and defining and plotting the natural history of the disease.

Data gathering about urologic diseases

Literature review: An extensive review of the literature was conducted to determine the epidemiology of selected urologic diseases in the Islamic Republic of Iran. Reviews were performed from various sources in order to identify published literature or unpublished data within the last 5 years: the website of the Iranian National Research Centre [4], PUBMED (the National Center for Biotechnology Information website) [5], local and national medical journals (from 1999 to 2004 over 1000 issues of 40 different journals) and medical students' theses.

Databases of health status: Certain publicly available surveys on health status were integral to this study. The goal of the database analysis was to develop estimates of the prevalence in the Islamic Republic of Iran of the urologic diseases included in the study. For some selected urologic diseases, we gathered national data from hospital registry systems, pathological registry systems and mortality data from vital registry systems [6]. In calculating the burden of disease, death counts were stratified by sex and age [3,7].

Urologist consensus: After estimating the epidemiological indicators of selected urologic diseases in the Islamic Republic of Iran, a questionnaire was provided about these indicators and sent to 19 urologists.
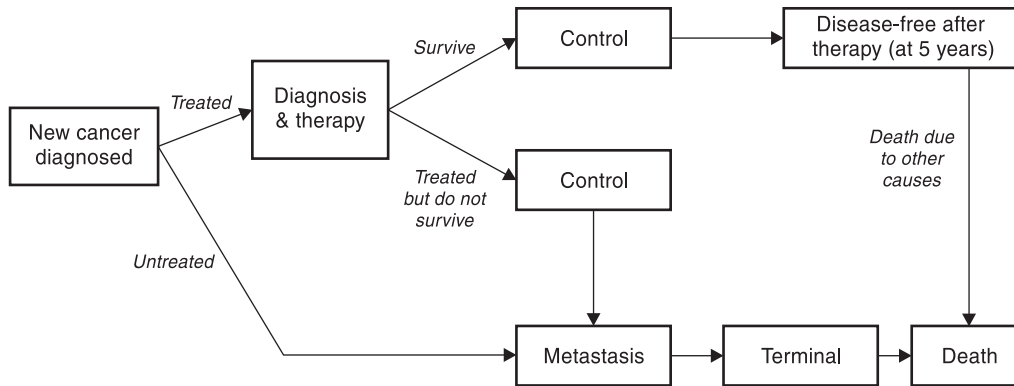
Figure 1 **Disease model for cancer used in estimation of the burden of urologic diseases in the Islamic Republic of Iran**

The urologists ranked each disease from 1 to 4 considering the prevalence rate, mortality rate, disability and costs. Data from this survey were used to validate the findings from the literature and database analyses.

Assessment and revision of estimates: After all analyses were completed from the individual datasets, the reliability and validity of the data was assessed. Data consistency and quality were checked using the unweighted cell count for each variable, and the overall age distribution of the datasets, the methods used in sampling and the population were all considered in selecting the definitive source for a urological data point. Internal consistency was checked using *DisMod II* software, adjusting for non-representativeness in the urologists' consensus.

Computing the disability weights

The disability weights (DW) of 3 of the 13 selected urologic diseases (hyperplasia of the prostate, malignant neoplasm of the prostate and malignant neoplasm of the bladder) have been defined by *GBD 2000* (Table 1) [3]. Therefore, we prepared a

questionnaire and sent it to 15 urologists. In this questionnaire we asked urologists to compare the other 10 selected urologic diseases with the 3 urologic diseases which had DW from *GBD 2000* and from this to estimate the DW. According to the opinions of the urologists and 10 experts at the Iranian Ministry of Health, there are sufficient health facilities in the country and the great majority of patients refer to these centres for care, so that the number of untreated form of urologic disease can be considered negligible. Therefore the DW of all urologic disease was computed by their treated form (Table 1).

Data analysis

Since the numbers of incident cases were not available directly from disease registers or epidemiological studies and only prevalence data were available, a software programme called *DisMod II* was used to model incidence and duration from estimates of prevalence, remission, case fatality and background mortality [1]. The estimated population and mortality rate of the diseases by age and sex groups were

entered into *DisMod II*. The total national population of the Islamic Republic of Iran was 66 518 224 (males: 33 621 920, females: 32 896 304) and the mortality rate for all casues was 5.29 per 1000 in men and 4.03 per 1000 in women [*8*].

Computing the DALY

DALYs were calculated as the sum of the years of life lost (YLLs) due to premature mortality in the population and the years lived with disability (YLDs) for incident cases of the health condition [*6*]. Where remission rates and/or case fatality rates were not known, they were estimated from the available evidence [*9*]. We also used the most recent Iranian life expectancy tables for this process [*10*].

Statistical methods

All data were analysed using *DisMod II* and the output of *DisMod II* data was sent to Microsoft *Excel* software for computing the DALY. The assumptions for calculating DALYs were as follows: B (standard age weights) = 0.04, r (standard discount rate) = 0.03, C (standard age weights) = 0.1658, and K (full age weights) = 1.

Results

From the national registry data, the overall results were as follows. For malignant neoplasm of the prostate the incidence was 7 per 100 000 population, the mortality rate 4 per 100 000 population and the remission rate 970 per 1000 patients. The incidence, mortality and remission rates for malignant neoplasm of the testis were < 1 per 100 000, 50 per 100 000 and 470 per 1000 patients respectively. For malignant neoplasm of the kidney the data were 1.5 per 100 000, 0.7 per 100 000 and 170–960 per 1000 patients respectively and for malignant neoplasm of

the bladder 6 per 100 000, 6.5 per 100 000 and 550–880 per 1000 patients.

The prevalence of other conditions was as follows: calculus of the kidney 3.5 per 100 000, acute cystitis 15 per 100 000 in females > 40 years old, hyperplasia of the prostate 30 per 100 000 in males > 50 years old, chronic prostatitis 8.5 per 100 000 in males > 20 years old, male infertility 1.47 per 100 000, hypospadias 5.49 per 100 000 in males < 1 year old and adult polycystic kidney disease 8.5 per 100 000. The incidence of congenital vesicoureteral reflux was 97.2 per 100 000 population aged < 1 years. Tables 2 and 3 show the details of the epidemiological indicators for different urologic diseases by age group [*11–16*].

Table 4 shows the YLD, YLL, and DALY of urologic diseases by sex and per population. Calculus of kidney/calculus of ureter had the highest DALY value at 145 172, followed by acute cystitis, 75 938 and chronic prostatitis, 75 852.

Discussion

This study shows that renal calculus, acute cystitis, chronic prostatitis, benign prostate hyperplasia, male infertility and adult polycystic kidney disease engendered the greatest burdens of urologic diseases in the Islamic Republic of Iran. Malignancies of the urogenital system gave lower burdens and congenital abnormalities a very low burden. If the burden of disease is used as the main criteria for public health priorities, the diseases with the highest burden are the priorities for care of urologic disease in our country.

Despite the lack of any developed health registry system in the Islamic Republic of Iran, this study was able to estimate the burden of urologic diseases by using many different sources, such as national reports,

Table 2 Validated data of malignant urologic diseases in the Islamic Republic of Iran during 1999–2004

Variable	Age (years)	Malignant neoplasm of prostate	Malignant neoplasm of testis	Malignant neoplasm of kidney, except renal pelvis, metastatic		Malignant neoplasm of kidney, except renal pelvis, organ-confined		Malignant neoplasm of bladder, invasive or metastatic		Malignant neoplasm of bladder, superficial	
		M	M	M	F	M	F	M	F	M	F
Incidence (per 100 000)	0–14	0.0	0.1	0.1	0.1	0.2	0.2	0.0	0.0	0.0	0.0
	15–24	0.1	0.4	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0
	25–34	0.0	1.2	0.1	0.2	0.3	0.5	0.9	0.2	3.7	0.9
	35–44	0.0	1.3	0.9	0.6	2.1	1.4	2.7	0.6	10.7	2.4
	45–54	72.4	0.7	2.4	1.5	5.7	3.5	9.6	2.0	38.2	8.1
	55–64	84.2	0.6	3.0	2.4	7.0	5.5	18.2	5.2	72.8	20.6
	65–74	121.3	0.8	4.6	4.0	10.8	9.4	35.6	13.3	142.3	53.0
	75–84	224.1	0.4	4.9	0.5	11.3	1.2	88.9	20.5	355.5	82.2
	85+	141.6	1.2	0.0	0.0	0.0	0.0	48.3	9.8	193.4	39.2
Remission rate (per 1000)	0–49	1000	470	170	170	960	960	880	880	504	504
	50+	970	–	–	–	–	–	–	–	–	–
Mortality rate (per 100 000)	0–4	0.0	50[a]	0.18	0.10	0.43	0.22	0.00	0.00	0.00	0.00
	5–14	0.0	–	0.02	0.04	0.05	0.10	0.00	0.00	0.02	0.00
	15–49	0.3	–	0.07	0.12	0.16	0.29	0.00	0.02	0.17	0.02
	50+	27.5	–	1.11	0.84	2.58	1.95	0.63	1.22	7.14	2.51

[a]Case fatality rate (per 1000).
M = males, F = females.

Table 3 Validated data of other urologic diseases in Islamic Republic of Iran during 1999–2004

Variable	Calculus of kidney and ureter			Acute cystitis			Hyperplasia of prostate			Chronic prostatitis			Male infertility			Hypospadias			Polycystic kidney, adult type	
	Age (years)	M	F	Age (years)	M	F	Age (years)	M	F	Age (years)	M	F	Age (years)	M	F	Age (years)	M	F	Age (years)	Total
Prevalence (per 100 000)	0–19	1.2	0.7	0–19	0	1	0–49	0	0	0–19	0	0	0+	1.47	0	0–1	5.49	0	0–19	0
	20–29	4.0	2.2	20–39	0	2.5	50+	30	0	20+	8.5	0	–	–	–	>1	0	0	20–39	0.1
	30–39	8.1	4.5	40+	0	1.5	–	–	–	–	–	–	–	–	–	–	–	–	40+	0.85
	40–49	11.6	6.7	–	–	–														
	50+	7.4	4.2	–	–	–														
Incidence (per 100 000)	–	–	–	–	–	–	–	–	–	0–19	0	0	–	–	–	–	–	–	–	–
	–	–	–							20+	2.64	0								
Remission hazard (per 1000)	0+	3000	3000	0+	–	65639	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Remission rate (per 10 000)	–	–	–	–	–	–	0+	900	–	–	–	–	0+	85.5	–	0+	850	–	–	–
Mortality rate (per 100 000)[a]	0+	0	0	0+	0	0	0+	0	0	0+	0	0	0+	0	0	0+	0	0	0+	0

[a]All are non-fatal diseases and no cause of death was registered for these diseases in national reports.
M = males, F = females.

Table 4 Years of life lost (YLL) due to premature mortality, years lived with disability (YLD), and disability-adjusted life years (DALY) of urologic diseases in the Islamic Republic of Iran by *ICD 10* codes [*International statistical classification of disease and related health problems*, 10th revision]

Disease	ICD-10 code	Male			Female			DALY total	DALY/ 100 000 population
		YLD	YLL	DALY	YLD	YLL	DALY		
Calculus of kidney, calculus of ureter	N20.0 N20.1	92 522	176	92 698	52 377	96	52 474	145 172	218.2
Acute cystitis	N30.0	0	0	0	75 470	468	75 938	75 938	114.2
Chronic prostatitis	N41.1	75 709	142	75 852	0	0	0	75 852	114.0
Hyperplasia of prostate	N40.0	30 174	55	30 229	0	0	0	30 229	45.4
Male infertility	N46	22 210	0	22 210	0	0	0	22 210	33.4
Polycystic kidney, adult type	Q61.2	6 652	181	6 833	6 633	164	6 797	13 630	20.5
Malignant neoplasm of prostate	C61	1 107	9 757	10 864	0	0	0	10 864	16.3
Malignant neoplasm of kidney	C64	144	2 672	2 816	66	3 290	3 355	6 172	9.3
Malignant neoplasm of bladder	C67	965	3 194	4 160	399	1 420	1 819	5 978	9.0
Malignant neoplasm of testis	C62	45	439	484	0	0	0	484	0.7
Congenital vesicoureteral reflux	Q62.7	24	0	24	23	0	23	47	0.1
Hypospadias	Q54	4	0	4	0	0	0	4	0.0

local researches, published and unpublished data and expert opinions. The diseases could not be differentiated into different forms as the dynamic model which we designed in the first steps of our study shows. For example, Figure 1 shows that the disease model for cancer had components of treated and untreated, diagnosis and primary therapy, control/waiting, preterminal (metastasis) and terminal. Since the availability of detailed data was very limited and the expert opinions could not estimate the percentage relating to these components for each disease, we assumed the treated form for all diseases, and the disability weight was computed only for the treated forms.

General methods for uncertainty analysis of estimates for the urologic burden of disease was done for the diseases [17] and the output of *DisMod II* was checked for reliability and validity by urologists and an epidemiologist. We were unable to locate any studies or reports about the incidence or prevalence of calculus of the kidney and ureter, acute cystitis, hyperplasia of the prostate and chronic prostatitis in the Islamic Republic of Iran. To estimate the incidence or prevalence for these diseases, an expert consensus was carried out by 11 urologists and 8 members of the National Urologic Board.

Our method for computing DW is a new and practical method. Since expert urologists have considerable experience with urologic diseases, they are able to compare diseases for which the DW is unknown with those urologic diseases for which the DW had already been defined by *GBD 2000*. This new method needs to be validated by other studies. DW can vary across different studies [18], but since the DW of urologic diseases had not been computed before, we cannot compare our data for DW with other studies.

In the Eastern Mediterranean Region (EMR), with a population of 481 635 000,

the burden of prostate cancer, bladder cancer, benign prostate hyperplasia has been estimated at 10.1, 48.2 and 40.3 year per 100 000 population [19]. In the world population of 6 045 017 000, these had been estimated as 24.3, 25.2 and 40.0 years per 100 000 population respectively in 2000 [20]. Another estimate of DALY for the burden of these diseases was made for the year 2001. In that report, the burden of these diseases was estimated at 50.8, 49.3 and 61.4 years per 100 000 population in the world, and in EMR countries the burden was estimated as 21.5, 92.0 and 64.2 years per 100 000 population respectively [19]. In our study, the figures were 16.3, 9.0 and 45.4 years per 100 000 population in 2003 (Table 4). We see many differences in the DALY for each of these 3 diseases in data from the populations of the world, the EMR and the Islamic Republic of Iran. These differences may be due to the difference in incidence or prevalence rates, source of data, validity of data and the mechanism of estimation of the data. We did not find any published or unpublished data about the DALY of the other urologic diseases included in our study, and therefore no comparison of DALY could be made for these diseases.

Traditionally, medical education programmes, health and medical facilities and research have focused on the diseases with the highest mortality rates, highest incidence/prevalence or disabling diseases. The first application of our study results is to the revision of medical education, health care facilities and research priorities in the community. Policy-makers also need to reallocate health budgets to the diseases that have the greatest burden in the community, and to advise continuing medical education programmes to enforce these as priority subjects for education. The epidemiological features of many urologic diseases have not been defined before in the Islamic Republic

of Iran. Therefore we recommend designing such studies, as the DW of urologic diseases is the subject of intense debate about disease burdens. We also recommend standardizing the DW at the international level in order to facilitate comparisons of diseases across different regions or countries.

Acknowledgements

References

1. Mathers CD et al. *National burden of disease studies: a practical guide*, 2nd ed. Geneva, World Health Organization, Global Programme on Evidence for Health Policy, 2001.

2. *International statistical classification of disease and related health problems*, 10th revision. Geneva, World Health Organization, 1993:549–97.

3. Mathers CD, Sabaté E, Lopez AD. *Guidelines for epidemiological reviews: the Global Burden of Disease 2000 project*. Geneva, World Health Organization, 2001 (revised):27–34.

4. *IRANDOC. Iranian Research Institute for Scientific Information and Documentation* [website] (http://www.irandoc.ac.ir, accessed 23 January 2008).

5. *PUBMED. National Center for Biotechnology Information* [website] (http://www.ncbi.nlm.nih.gov/entrez/query.fcgi, accessed 23 January 2008).

6. Murray CJL, Lopez AD. *Global health statistics: a compendium of incidence, prevalence and mortality estimates for over 200 conditions*. Cambridge, Massachusetts, Harvard University Press on behalf of the World Health Organization and the World Bank, 1996:25–6.

7. Naghavi M, Jamshidi AR, Akbari ME. [*Burden of diseases in 3 provinces of Iran in 2003*]. Ministry of Health and Medical Education, Tehran, Islamic Republic of Iran, 2003 [in Farsi].

8. [*Estimation of population and age and sex mortality rate, at the end of 2003*]. Tehran, Iranian Statistical Centre, 2005 [in Farsi].

9. Lewison G, ed. *Gastroenterology in the UK: the burden of disease. PRISM project 9608*. London, Welcome Trust, 1997.

10 *Human development reports. Iran (Islamic Republic of)* [website] (http://hdrstats.undp.org/countries/country_fact_sheets/cty_fs_IRN.html, accessed 23 January 2008).

11. *National Cancer Registry Report in 2000*. Tehran, Cancer and Genetic Centre, Centre for Disease Control, Ministry of Health and Medical Education, 2003:79–80.

12. Naghavi M. [*Mortality views in 18 provinces in Iran 2001*]. Tehran, Ministry of Health and Medical Education Research and Development Office, Health Network Development and Health Promotion Center, 2003:102–20 [in Farsi].

13. *Statistics by country for male infertility. Incidence (annual) of male infertility* [website] (http://www.wrongdiagnosis.com/m/male_infertility/stats-country.htm, June,2005 accessed 23 January 2008).

14. Darabi MR, Rahmani MM. [Congenital External urologic abnormality in male infants]. *Mashad medical journal*, 2000, 43(68):78–85 [in Farsi].

15. *Statistics by country for polycystic kidney disease. Prevalance of polycystic kidney disease* [website] (http://www.wrongdiagnosis.com/p/polycystic_kidney_disease/stats-country.htm, accessed 23 January 2008).

16. Askari SA, Milani F, Mansoor-Ghanaei M. [Congenital urologic malformation in neonates]. *Gilan medical journal*, 2000, 9(35/36):28–33 [in Farsi].

17. Salomon JA et al. *Methods for life expectancy and healthy life expectancy uncertainty analysis*. Geneva, World Health Organization, 2001 (Global Programme on Evidence for Health Policy Working Paper No. 10).

18. Essink-Bot M-L et al. Cross-national comparability of burden of disease estimates: the European Disability Weights Project. *Bulletin of the World Health Organization*, 2002, 80(8):644–52.

19. *Global burden of disease estimates. World Health Organization Health statistics and health information systems* [website] (http://www.who.int/healthinfo/bodestimates/en/index.html, accessed 23 January 2008).

20. Mathers CD et al. *Global burden of disease 2000. Version 2 methods and results*. Geneva, World Health Organization, 2002 (Global Programme on Evidence for Health Policy Discussion Paper No. 50).