

Supplementary Appendix

This appendix has been provided by the authors to give readers additional information about their work.

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Supplementary material

Survey design and implementation

The survey was conducted under the leadership of the Federal Ministry of Health, in partnership with the Ministry of Planning and Development Cooperation, Central Organization for Statistics and Information Technology (COSIT), the Ministry of Health, Kurdistan, and the Kurdistan Regional Statistics Office. Researchers with background in demography, epidemiology and statistics from these ministries were involved in all steps of the design and implementation of the survey. Technical support was provided by WHO.

The main objectives of the survey were to collect data on mortality, self-reported morbidity including chronic illness, reproductive health, health expenditures and mental health status. The IFHS data collection tool consisted of three questionnaires administered to different individuals in the household. The head of the household responded to general questions; a randomly selected adult (aged 18 years and over) responded to mental health questions and were invited for a later interview as part of the full mental health survey; and all women 15-49 years to a reproductive health questionnaire. The questionnaires were translated into Arabic and Kurdish. (For detailed information on the content of the questionnaire, consult the IFHS report at <http://www.emro.who.int/iraq/ifhs.htm>.)

The household questionnaire collected data on the household members, environmental risk factors, household possessions and self-reported chronic illnesses and data on all deaths that occurred in the household from June 2001 to the time of the survey. The

respondents were first asked whether the household experienced any death(s) during this period. For each death, data were recorded on sex, age at death, time and place of death, whether medical attention was sought prior to the death, and the main cause of death according to the respondent. The interviewers coded the responses using a list of 23 probable causes.

Sample design

The IFHS sample was designed to provide estimates on a wide range of health-related indicators at the national and governorate levels as well as by rural and urban residence. The country's 18 governorates were divided into 56 different sampling domains (strata). Apart from Baghdad, each of the 17 governorates were divided into three domains (metropolitan or the governorate capital; other urban, and rural area). For Baghdad governorate, five sampling domains were created (Sadr City, Rusafah Side, Karkh Side, other urban and rural Baghdad). Each of the 56 domains, was allocated 18 clusters (or census enumeration areas), and from each cluster 10 households were selected; therefore, the target sample size was 10,080 households.

The originally allocated sample sizes for Baghdad-Karkh domain, Anbar and Nineveh governorates were inflated prior to the fieldwork by 6 (33.3% increase in clusters), 54 (100%) and 18 (33.3%), respectively. This brought the total number of households to 1,086 clusters (or 10,860 households). This was to compensate for the expected difficulties in accessing some of the selected clusters due to security problems in these areas. The over-sampling was prompted by the COSIT Multiple Indicator Cluster Sample survey (MICS3) experience in these governorates in 2006 (13).

To capitalize on a recently updated sampling frame, it was decided to use a subset of the MICS3 clusters, the primary sampling units (PSUs), which had been selected with probability proportional to size. Clusters were paired according to geographical proximity prior to the selection, to create implicit stratification, and the number of selected households in each cluster was increased from 6 to 10. Household is defined as a group of people who live under one roof, and participate in the household budget partially or completely, eat and drink from a common source eat (from one pot), and they might be blood related or not (Source: Rapid survey of Family Budget Iraq 2005, Ministry of Planning and development cooperation, Central Organization for Statistics & Information Technology).

The sampling frame used in the South/Centre governorates was derived from the 1997 census, which had been updated for the Iraq Living Conditions Survey 2004, while in Kurdistan the frame was based on information provided by the Statistical Offices in the region. A new updated list of households in the selected PSUs was conducted 3 days before the survey teams visited the cluster and a linear random systematic sampling was used to select 10 households in each cluster. Therefore, IFHS is a two-stage stratified sample survey of households (stage 1 selection of clusters (PSU), stage 2 selection of households). Due to different selection probabilities of households into the sample, design weights were calculated and further adjusted for non-response at cluster and household levels.

Implementation

Training of central and local supervisors from all 18 governorates was conducted in Amman, Jordan. Training of the interviewers was done separately in each

governorate, by the central supervisors and in coordination with central supervisors for one week during May-June 2006 and a one day refresher training was conducted a day before the start of the survey in each governorate. A one-week training course was conducted for the central data editors on checking the questionnaire's responses and cluster tracking forms for completeness and consistency.

For data management, a two-week training workshop on CSPro 3.2 software (<http://www.census.gov/ipc/www/cspro/index.html>.) was conducted in Amman for the supervisors from both regions in July 2006, followed by in-country training for the data entry personnel. Following interviewer training, the survey instruments and procedures were pilot tested in all governorates.

The survey fieldwork was implemented in phases to ensure close supervision especially in the areas of hot areas. In 14 South/Centre governorates, the fieldwork was conducted during August-September 2006. In Anbar governorate, the fieldwork was conducted during October-November. In the three governorates of the Kurdistan region, the survey was fielded during February - March 2007, after the translation of the questionnaire and the training of the interviewers, which took place between December 2006 and January 2007.

The teams were closely supervised throughout the fieldwork by the field, local and central supervisors. Each week, checked and completed clusters in the South/Centre were sent to the Federal Ministry of Health in Baghdad for further checking and editing. The central supervisors and editors reviewed all forms and returned any that were incorrect or incomplete to the respective governorate. Open-ended questions

were coded and questionnaires for each cluster were then forwarded to the data entry team in batches. All data were double entered and verified. Similar procedures were followed in the three Kurdistan governorates.

Overall, 407 personnel participated in the implementation of the survey, 53% were female, mainly interviewers.

	Male	Female	Total
Central supervisors	5	16	21
Local supervisors	7	13	20
Field supervisors	36	23	59
Central editors	11	17	28
Data entry personnel	21	34	55
Interviewers	112	112	224
Total	192	215	407

Correction of reporting bias in the sibling data

The first bias is that the probability of a sibling-set being sampled is proportional to the number of female siblings aged 15-49 alive at interview time. To adjust for this bias, the age-sex-specific death rates were calculated by first dividing both numbers of sibling deaths (D) and person-years lived (PYR) for each respondent's siblings by the number of female siblings in the family aged 15-49 alive at interview time (S). The second bias correction accounted for the deaths and person-years for families with zero survivors, which were missed by the survey. These deaths and person-years were estimated using age-sex specific regressions of $\ln(D/S)$ against S and (PYR/S) against S to predict $D(S=0)$ and $PYR(S=0)$. Quadratic regression functions provided good fits and R-squared values were mostly above 0.90.

E-Table 1: adjustment for missing clusters using IBC data

	IFHS		IBC		IBC/IFHS
	Rate	RR	Rate	RR	
Baghdad	1.30	1.56	4.23	3.08	1.980
Anbar	0.98	1.18	2.30	1.68	1.428
High mortality governorates	0.83	1.00	1.37	1.00	1.000
Low mortality governorates	0.60	0.72	0.61	0.45	0.622

Rate=Mortality rate per 1000 person years

RR=Mortality rate ratio (RR) compared to high mortality governorates

E-Table 2: Projected Iraq mid year population, 1999-2006, by level of mortality

Region	1999 ⁽¹⁾	2003 ⁽²⁾	2004 ⁽³⁾	2005 ⁽²⁾	2006 ⁽⁴⁾	IFHS ⁽⁵⁾
Baghdad	5,756,723	6,394,645	6,554,126	6,758,388	6,962,650	12,879
High mortality	8,299,157	9,391,568	9,664,671	9,974,738	10,284,805	23,350
Nineveh	2,176,585	2,478,733	2,554,270	2,638,600	2,722,930	6,545
Diala	1,209,305	1,355,535	1,392,093	1,451,958	1,511,823	2,763
Al-Anbar	1,102,458	1,283,512	1,328,776	1,380,247	1,431,717	2,771
Babylon	1,263,021	1,430,528	1,472,405	1,534,848	1,597,291	4,291
Salah Al din	926,555	1,080,806	1,119,369	1,133,386	1,147,402	2,925
Al-Basra	1,621,233	1,762,453	1,797,758	1,835,700	1,873,642	4,055
Low mortality	6,276,923	7,106,992	7,314,509	7,530,085	7,745,660	17,363
Kirkuk	780,506	839,677	854,470	870,210	885,950	1,774
Kerbela	643,640	739,026	762,872	807,918	852,963	1,714
Wasit	832,837	943,591	971,280	1,002,059	1,032,838	2,485
Al-Najaf	828,042	948,328	978,400	1,012,131	1,045,862	2,103
Al-Qadisiya	793,685	888,049	911,640	937,592	963,543	2,124
Al-Muthanna	467,554	537,506	554,994	574,672	594,350	1,731
Thi-Qar	1,260,164	1,447,058	1,493,781	1,530,341	1,566,901	3,488
Maysan	670,495	763,757	787,072	795,163	803,253	1,943
Kurdistan	3,049,265	3,494,875	3,606,278	3,863,906	4,121,534	8,044
Dhok	421,480	462,086	472,238	691,610	910,981	2,127
Al-Sulaimaniya	1,454,788	1,663,426	1,715,585	1,818,837	1,922,088	3,430
Erbil	1,172,997	1,369,363	1,418,455	1,353,460	1,288,465	2,488
Total						
Projected	23,382,068	26,388,081	27,139,584	28,127,117	29,114,649	61,636
Adjusted for migration			26,769,584	27,597,117	28,514,649	

⁽¹⁾ ICMMS in-depth analysis, ⁽²⁾ Interpolated, ⁽³⁾ Burnham et al 2006 & ILCS, ⁽⁴⁾ COSIT, figures were used to calculate the survey sample base-weights

⁽⁵⁾ IFHS Household roster

E-Table 3: Distribution of reported causes of death, by region, sex and time to invasion (January 2002 to June 2006)

	Region				Sex				Relative to invasion				Total	
	South/Centre		Kurdistan		Male		Female		Pre (Jan02-Feb03)		Post (Mar03-Jun06)		n	(%)
	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)		
<u>Violent death</u>														
Intentional injuries	18	(1.5)			17	(2.1)	1	(0.2)		(0.0)	18	(1.6)	18	(1.3)
Injuries/armed conflict	144	(12.0)	2	(1.7)	137	(16.7)	8	(1.6)	6	(2.9)	139	(12.4)	146	(11.0)
<u>Non-violent death</u>														
Road accidents	40	(3.3)	6	(5.0)	35	(4.3)	10	(2.0)	4	(2.0)	42	(3.7)	46	(3.4)
Unintentional injuries	64	(5.3)	9	(7.5)	44	(5.4)	28	(5.6)	11	(5.4)	61	(5.4)	72	(5.5)
Maternal death	4	(0.3)					4	(0.8)			4	(0.4)	4	(0.3)
Prematurity complications	30	(2.5)	1	(0.8)	18	(2.2)	13	(2.6)	12	(5.9)	19	(1.7)	31	(2.3)
Newborn deaths	71	(5.9)	10	(8.3)	40	(4.9)	41	(8.2)	16	(7.8)	65	(5.8)	81	(6.1)
Congenital anomalies	27	(2.2)	6	(5.0)	17	(2.1)	16	(3.2)	3	(1.5)	30	(2.7)	33	(2.5)
Sudden death	49	(4.1)	11	(9.2)	33	(4.0)	27	(5.4)	11	(5.4)	49	(4.4)	60	(4.5)
Acute lower RTI	22	(1.8)	2	(1.7)	17	(2.1)	7	(1.4)	5	(2.5)	19	(1.7)	25	(1.9)
Intestinal infections	34	(2.8)	5	(4.2)	20	(2.4)	19	(3.8)	7	(3.4)	32	(2.9)	39	(2.9)
Septicaemia	17	(1.4)			5	(0.6)	12	(2.4)	2	(1.0)	15	(1.3)	17	(0.6)
Cancers	93	(7.7)	8	(6.7)	50	(6.1)	50	(10.0)	13	(6.4)	88	(7.9)	101	(7.6)
Diabetes	34	(2.8)	4	(3.3)	18	(2.2)	21	(4.2)	3	(1.5)	36	(3.2)	39	(2.9)
Asthma	14	(1.2)	1	(0.8)	11	(1.3)	4	(0.8)	3	(1.5)	13	(1.2)	15	(1.1)
Renal failure	45	(3.7)	3	(2.5)	32	(3.9)	16	(3.2)	2	(1.0)	46	(4.1)	48	(3.6)
Tuberculosis	8	(0.7)			5	(0.6)	3	(0.6)	2	(1.0)	6	(0.5)	8	(0.6)
Cardiac disease	173	(14.4)	27	(22.5)	126	(15.3)	74	(14.7)	31	(15.2)	170	(15.2)	201	(15.2)
Respiratory tract diseases	27	(2.2)	1	(0.8)	16	(1.9)	12	(2.4)	11	(5.4)	17	(1.5)	28	(2.1)
Hereditary blood disorders	5	(0.4)			4	(0.5)	0		3	(1.5)	2	(0.2)	5	(0.4)
Cerebro-vascular accident	107	(8.9)	4	(3.3)	57	(6.9)	55	(11.0)	21	(10.3)	90	(8.0)	112	(8.4)
Geriatric condition (old age)	99	(8.2)	3	(2.5)	58	(7.1)	44	(8.8)	21	(10.3)	81	(7.2)	102	(7.7)
Others	8	(0.7)	2	(1.7)	6	(0.7)	4	(0.8)	4	(2.0)	6	(0.5)	10	(5.2)
Don't know	72	(6.0)	14	(11.7)	54	(6.6)	33	(6.6)	12	(5.9)	74	(6.6)	86	(2.7)
Total	1205	(100.0)	120	(100.0)	822	(100.0)	502	(100.0)	204	(100.0)	1121	(100.0)	1325	(100.0)

* Other causes (include 5 Jaundice; 1 Rabies; 3 post-operative complication; 1 Typhoid)

E-Table 4: Mortality rates (per 1,000 PYRs), by period, region, sex and age at death (January 2002-June 2006)

	Exposure per (1,000 persons yrs)	All causes			Non-violence			Violence		
		Rate	95%CI		Rate	95%CI		Rate	95%CI	
<u>Unadjusted for missing clusters</u>										
Total	259.81	5.10	(4.72	5.52)	4.47	(4.11	4.86)	0.63	(0.50	0.80)
Post-invasion (Mar03-Jun06)	195.55	5.73	(5.26	6.25)	4.93	(4.49	5.41)	0.80	(0.63	1.03)
<u>Adjusted for missing clusters</u>										
Total	260.00	5.31	(4.89	5.77)	4.47	(4.11	4.86)	0.84	(0.63	1.15)
Region										
South/centre	226.06	5.58	(5.11	6.09)	4.61	(4.22	5.05)	0.96	(0.72	1.32)
Kurdistan	33.94	3.53	(2.87	4.38)	3.48	(2.83	4.32)	0.05	(0.01	0.28)
Sex										
Male	131.69	6.66	(5.98	7.44)	5.07	(4.54	5.68)	1.59	(1.18	2.20)
Female	128.32	3.93	(3.46	4.47)	3.85	(3.38	4.39)	0.08	(0.04	0.19)
Age group (years)										
<15	95.31	4.19	(3.62	4.88)	3.93	(3.42	4.53)	0.26	(0.05	2.71)
15-59	150.34	3.22	(2.77	3.77)	1.97	(1.68	2.32)	1.26	(0.94	1.73)
15-29	79.06	2.18	(1.66	2.91)	1.06	(0.77	1.50)	1.12	(0.74	1.78)
30-44	46.29	2.91	(2.23	3.86)	1.50	(1.11	2.07)	1.41	(0.88	2.37)
45-59	24.99	7.12	(5.76	8.92)	5.71	(4.52	7.32)	1.41	(0.81	2.68)
60+	14.36	34.61	(30.59	39.26)	34.20	(30.22	38.81)	0.41	(0.18	1.16)
Period										
Pre-invasion (Jan02-Feb03)	64.34	3.17	(2.70	3.75)	3.07	(2.61	3.63)	0.10	(0.04	0.32)
Post-invasion (Mar03-Jun06)	195.67	6.01	(5.49	6.60)	4.92	(4.49	5.41)	1.09	(0.81	1.50)
Mar03-Dec04	100.55	5.92	(5.22	6.74)	4.90	(4.35	5.55)	1.02	(0.62	1.80)
Jan05-Jun06	95.13	6.11	(5.37	6.99)	4.95	(4.32	5.69)	1.16	(0.82	1.70)

E-Table 5: Sex-specific all cause mortality rates (per 1,000 person-years), by period calculated from reported deaths in household and from sibling survival questions. All Iraq, age group 15-59 years

	Household deaths			Sibling deaths	
	Rate	95%CI		Rate	Ratio
Before invasion					
Male	1.97	(1.31	3.09)	2.22	1.13
Female	0.83	(0.49	1.51)	1.23	1.49
Post-invasion					
Male	5.85	(4.70	6.83)	3.18	0.54
Female	1.95	(1.45	2.66)	1.17	0.60