

HEALTH AND WELFARE IN IRAQ

AFTER

THE GULF CRISIS

AN IN-DEPTH ASSESSMENT

International Study Team

October 1991

HEALTH AND WELFARE IN IRAQ AFTER THE GULF CRISIS AN IN-DEPTH ASSESSMENT

From August 23 to September 5, the International Study Team on the Gulf Crisis comprehensively surveyed the impact of the Gulf Crisis on the health and welfare of the Iraqi population.

The Team consisted of eighty-seven researchers drawn from a wide variety of disciplines, including agriculture, electrical engineering, environmental sciences, medicine, economics, child psychology, sociology, and public health.

Team members visited Iraq's thirty largest cities in all eighteen Governorates, including rural areas in every part of the country. The mission was accomplished without Iraqi government interference or supervision. Principal funding was supplied by UNICEF, the MacArthur Foundation, the John Merck Fund, and Oxfam-UK.

The study team has prepared separate in-depth reports on the Gulf Crisis and its impact on Iraqi civilians focused on the following subjects:

1. Child Mortality and Nutrition Survey
2. Health Facilities Survey
3. Electrical Facilities Survey
4. Water and Wastewater Systems Survey
5. Environmental and Agricultural Survey
6. Income and Economic Survey
7. Child Psychology Survey
8. Women Survey

This statement summarizes the principal findings of the research. Individual project reports, representing the findings and views of individual authors, are available for more detailed information.

The economic and social disruption and destruction caused by the Gulf Crisis has had a direct impact on the health conditions of the children in Iraq. Iraq desperately needs not only food and medicine, but also spare parts to repair basic infrastructure in electrical power generation, water purification, and sewage treatment. Unless Iraq quickly obtains food, medicine, and spare parts, millions of Iraqis will continue to experience malnutrition and disease. Children by the tens of thousands will remain in jeopardy. Thousands will die.

CHILD MORTALITY AND NUTRITION SURVEY

Infant and child mortality and nutrition were assessed by conducting surveys in 9,034 households in every region of Iraq. The households were chosen on the basis of stratified random sampling techniques. The household survey was conducted by a team of 32 mostly female Arabic-speakers under the supervision of 10 public health specialists.

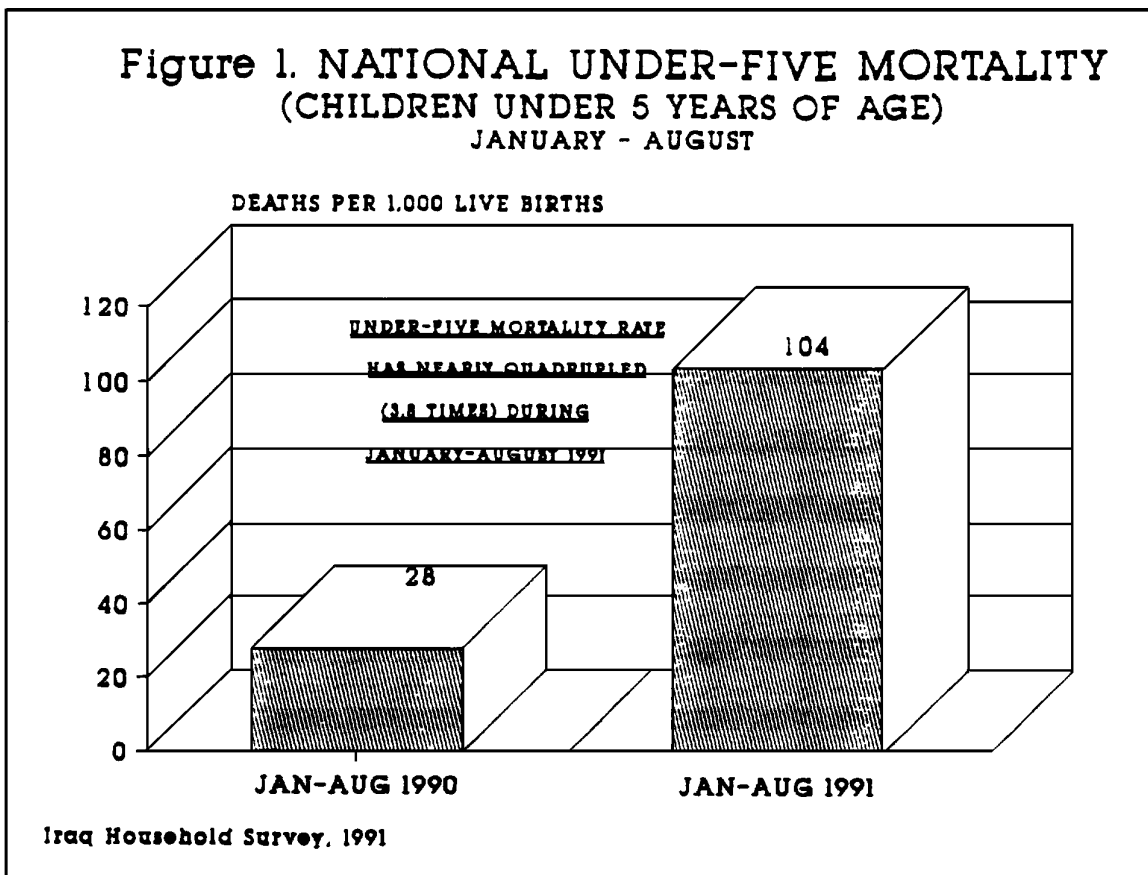
Within each household, mothers were questioned about the number of children born, the date of birth, whether the children were still alive, and, if deceased, the date of death. This is the standard method for obtaining accurate data on infant and child mortality.

Based on these interviews, it is estimated that the mortality rate of children under five years of age is 380 per cent greater today than before the onset of the Gulf Crisis (see Table One).

**TABLE ONE: National Under-Five Mortality Rate (Iraq)
January – August**

	<u>1991</u>	<u>1990</u>	<u>1991</u> <u>1990</u>
<u>Under-5</u> <u>Mortality</u> <u>Rate</u>	104.4	27.8	3.8

The practice of public health specialists is to state infant and child mortality as a proportion of live births. Before the Gulf Crisis, the mortality rate for children under five years of age was 27.8 deaths per thousand live births. Since the Gulf Crisis, the under-five mortality rate has increased to 104.4 deaths per thousand live births (see Figure One).

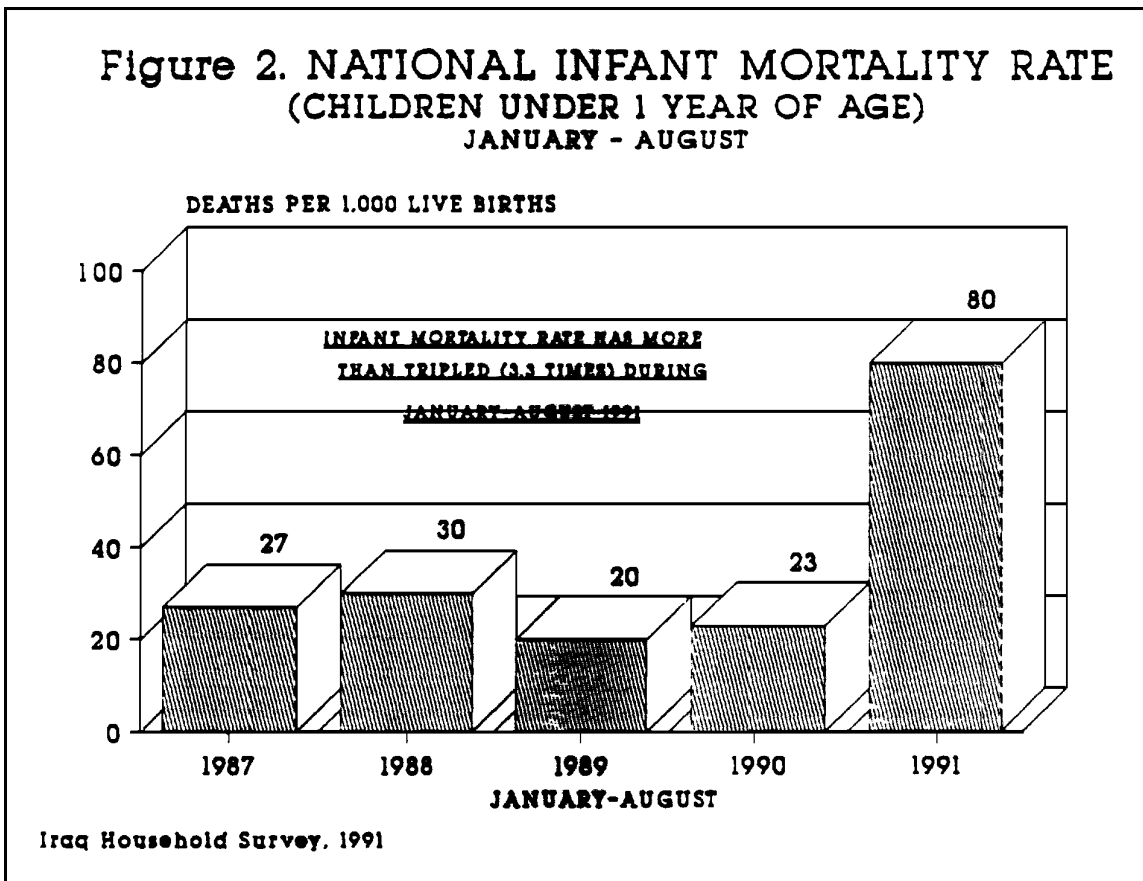


Furthermore, it is estimated that the mortality rate of children under one year of age (the infant mortality rate) is 350 per cent greater than before the onset of the Gulf Crisis (see Table Two).

**TABLE TWO: National Infant Mortality Rate (Iraq)
January – August**

	<u>1991</u>	<u>1990</u>	<u>1989</u>	<u>1988</u>	<u>1991</u> <u>1990</u>
<u>Infant</u> <u>Mortality</u> <u>Rate</u>	80.0	22.7	19.7	29.5	3.5

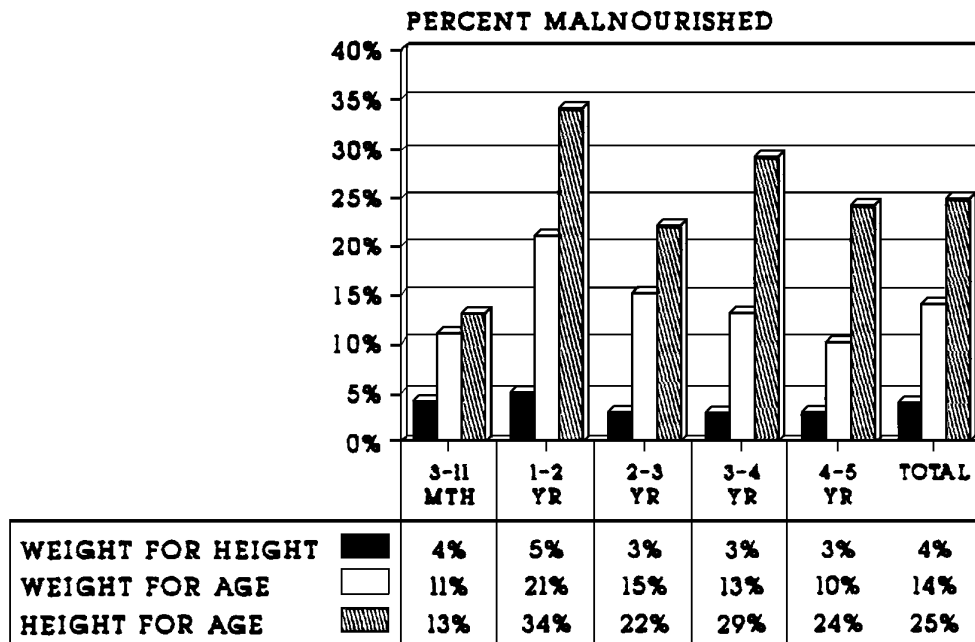
During January to August 1990, before the Gulf Crisis, the infant mortality rate was 22.7 deaths per thousand live births. Since the Gulf Crisis, the infant mortality rate has increased to 80.0 deaths per thousand live births (see Figure Two).



The rise in infant and under-five mortality is likely due to a complex interaction of factors. There are acute shortages of food and essential medicines throughout Iraq. Lack of clean drinking water and poor sanitation have greatly increased water-borne diseases, such as cholera, typhoid, dysentery, and gastroenteritis.

A random sample of 2,902 children registered during the course of the household survey were also measured for their height and weight. These figures were combined with the children's ages in order to estimate the incidence of malnutrition among infants and children in Iraq. Nutritional status was assessed by looking at three different criteria: 1) Height for Age; 2) Weight for Age; and 3) Weight for Height. According to internationally accepted practice, children were classified as malnourished if they fell two or more standard deviations below the median reference values of the World Health Organization (see Chart Three).

**Fig 3. PERCENT OF CHILDREN MALNOURISHED
(ACCORDING TO AGE GROUP)**



Iraq Household Survey, 1991

Nearly 29 per cent of the children assessed were malnourished under one or more of these criteria. According to the World Health Organization, there are a total of 3.3 million children under five years of age in Iraq. Applying the 29 per cent figure to this total number leads us to estimate that over 900,000 Iraqi children are malnourished.

The third criterion used to assess child malnutrition, weight for height, is a measure of severe food deprivation or deficient utilization. In a layperson's terms, a child who falls two or more standard deviations below the median value for weight for height is moderately or severely malnourished, with a significantly increased risk of dying. About 3.6 per cent of Iraqi children assessed were malnourished under this criterion (see Table Three). Applying this 3.6 per cent figure to Iraq's total population of children under five leads us to estimate that 118,000 children are either moderately or severely malnourished and therefore at increased risk of dying.

Table Three: Nutritional Status of Children Under Five (Iraq)

<u>Age</u> (yrs)	<u>Height</u> <u>for age</u>	<u>Weight</u> <u>For age</u>	<u>Weight</u> <u>for height</u>
3 – 11 months	12.9%	0.8%	4.1%
1 – 2	34.0%	20.9%	5.3%
2 – 3	22.2%	14.8%	2.8%
3 – 4	28.8%	12.9%	2.5%
4 – 5	23.9%	10.2%	2.8%
<u>Total</u>	24.7%	14.0%	3.6%

* Figure in box represents per cent malnutrition.
Malnutrition is a value more than two standard
deviations below the median reference value.

The incidence of severe malnutrition appears greatest among children between one and two years of age (see Figure Three). For example, 5.3 per cent of these children measure two standard deviations or more below the median value for weight for height and therefore, are considered moderately or severely malnourished and at extreme risk. Moreover, over one-third of children of this age are malnourished according to one or more of the three criteria.

HEALTH FACILITY SURVEY

The study team included five health professionals (three medical doctors and two public health specialists), who visited 29 hospitals and 17 community health centers located in nearly all governorates of Iraq. At each hospital, they conducted ward prevalence studies of admitted patients, interviewed facility directors, department heads, and physicians, and analyzed medical and hospital records of malnutrition and disease. The ward-based analysis concentrated on patients under the age of five.

Mortality for patients under five years of age varied dramatically throughout the country. For example, at Babel Pediatric Hospital, it has increased 3.9 times for the first seven months of 1991 while at Diwaniya, an increase of 1.2 fold was documented. The incidence of diseases was similarly uneven. With the improvement of Baghdad's water supply the risk of communicable diseases in Baghdad has substantially diminished in recent months, while in southern Iraq the morbidity pattern is substantially more acute and remains at epidemic or near-epidemic levels.

Within hospitals, infant and child malnutrition is clearly the most significant problem documented by the health facility team. Among in-patients at Erbil Pediatric Hospital, the prevalence of malnutrition, as an admitting diagnosis, was 71 per cent; at Sulaymaniyah, 66 per cent; at Mosul, 66 per cent; and at Ramadi Pediatric Hospital, 61 per cent. Food shortages and frequent gastroenteritis appear to have contributed to a very high level of malnutrition. This is reflected in the large increase in low birth weight babies. As an example, in Kut, low birth weight babies represent 30–50 per cent of all live births compared to 12–14 per

cent in 1990. The cost of infant formula on the open market has increased 2,000–3,000 per cent since August 1990.

In addition, water-borne diseases, including typhoid, gastroenteritis, and cholera are epidemic. Hepatitis has increased throughout Iraq and by as much as one hundred-fold in some areas. Meningitis is now widespread in southern Iraq. With the damage to child vaccination programs, such preventable diseases as measles and polio are also resurgent.

Strained health facilities operate at only a fraction of pre-crisis levels. Most lack even basic medical supplies such as vaccines, antibiotics, anesthetics and syringes.

Medicines are in extremely short supply. As a result, infectious diseases go untreated. There is little or no chloramphenicol for typhoid, fluids for rehydration of those suffering from cholera or gastroenteritis, or antibiotics for meningitis. Lack of vaccines and poor sanitary conditions have resulted in outbreaks or previously uncommon and preventable childhood disease, such as polio, measles, and tetanus.

Drugs for chronic diseases are also unavailable. The rate of coronary attacks has increased substantially because patients with heart disease are unable to obtain anti-angina medication. Teenage diabetics are dying because they cannot obtain insulin. Children with treatable leukemia are dying because anti-cancer drugs are largely non-existent. Laboratories, X-ray units, neonatal units, and operating theaters either do not function or provide only limited services.

Due to lack of water and detergent, sanitation was poor in nearly every hospital visited. The supply of water to most hospitals and health centers is sporadic. In a bacteriological survey conducted in southern Iraq, 30 per cent of hospital water sources were grossly polluted with coliform indicating fecal contamination. In Kurdish areas, tested water supplies of hospitals found heavy coliform pollution. Moreover, the water that is supplied is often contaminated with fecal matter. Lavatories are clogged. At several hospitals, raw sewage had backed up into the wards.

ELECTRICAL FACILITY SURVEY

The project surveyed the conditions of most major electrical facilities in Iraq. The sites were selected by team members to gain a comprehensive picture of conditions throughout the country. The study was comprised of site inspections and interviews at 24 facilities over a ten day period.

During the Gulf Crisis, enormous damage was inflicted upon the electrical generation infrastructure of Iraq. Since the cease fire, electrical generation has been restored to about 68 per cent of the 1990 peak load (5,162 MW) but, to only 37 per cent of the installed capacity (35 MW). The study estimates 75 per cent of electrical transmission lines are operable. All repairs have been done using salvaged parts and improvised methods.

Much of this repair, especially in the switchyards and first-span connections to transmission, does not meet normal standards of construction, poses increased safety risks, and is likely to break down. Without spare parts, replacement and further repair will not be possible. The store of salvageable parts is depleted. Iraq does not have the capability to manufacture the necessary items. Many are specific to the foreign companies from Europe, Japan, and North America that built or supplied all the power stations.

Finally, the study team documented the profoundly negative impact that the damaged and ill-repaired power generation system has had on, and will continue to have on, water purification and wastewater treatment and public health infrastructure generally.

WATER AND WASTEWATER SYSTEMS SURVEY

Civil and chemical engineers, inspected water and wastewater treatment plants, distribution systems, and collection systems in all parts of Iraq. Twenty-eight facilities including eighteen water treatment plants, eight wastewater treatment plants, one water supply and one aluminum sulfate plant were visited in thirteen cities.

Much of Iraq's water and water purification facilities function at only a fraction of pre-Gulf Crisis levels or not at all. Only one of eighteen water treatment plants inspected operated at 100 per cent capacity. Water distribution and purification suffer from minimal flow and lack of chlorine which is being rationed at all plants. The primary factors impairing water treatment and purification do not result from damage caused by the war and civil uprisings; but from a lack of spare parts and chlorine. Wastewater treatment, water delivery and purification are also substantially limited by the lack of electrical power.

Reduced water flows and insufficient levels of chlorine in the distribution system promote the incidence of water-borne diseases. The lack of electrical power has eliminated wastewater treatment in Baghdad and southern Iraq and raw sewage is being discharged into waterways. Sewage treatment is also dramatically reduced because of a lack of chlorine, spare parts and reliable electrical power. The study team estimates that if current trends continue, the entire water treatment and delivery system will deteriorate to the point of collapse. Within a matter of months, those critical public services are expected to be operating at only 5-10 per cent capacity.

ENVIRONMENT AND AGRICULTURAL SURVEY

Environmental and chemical engineers investigated and interviewed public health officials, environmental regulators and local residents concerning the environmental and public health consequences of the Gulf Crisis.

Team members collected drinking water samples at 158 randomly selected households in all 18 governorates in Iraq. The sampling framework of the public health survey team was used to collect drinking water samples.

Most of Iraq's population of 18 million is directly exposed to water-borne disease in their potable water supply. Each sample was tested for coliform or fecal contamination. The results were 106 positive for gross coliform contamination, 25 confirmed negative, and 27 unconfirmed negative. Roughly half the areas tested, weighted according to population density, showed positive evidence of gross fecal contamination. Only in Baghdad, where coliform media sampling was used, did over half the samples test negative. Team members documented unsanitary water source and waste disposal conditions in all cities surveyed. Common conditions observed included: (1) solid waste accumulating in the streets due to the lack of collection and landfilling equipment, (2) raw sewage overflows in the streets and around homes, (3) raw sewage being dumped directly into the rivers due to impaired or inoperable wastewater treatment plants, (4) children bathing and playing in these rivers, (5) people with little to no tap water supply because impaired or inoperable water treatment and distribution plants cannot generate adequate line pressure, (6) people drawing drinking water directly from the rivers, and (7) people drawing drinking water from holes dug in watermains, which are often contaminated by cross-connections from adjacent sewage pipes.

The team found that direct sewage contamination of water supplies results from two primary causes: inadequate chlorinating of discharges or bypassing treatment entirely; and contamination through breaks in the watermains.

Over 60 per cent of the population in five of the seven governorates surveyed no longer have tap water available in their homes because of low water supply system pressure. The low pressure is caused by lack of spare parts to maintain pumps, power outages, and breaks in the water mains.

INCOME AND ECONOMIC SURVEY

Two economist members of the team studied the impact of the Gulf Crisis on economic activity, private incomes, public distribution and household consumption.

More than a year of war and internal conflicts have had a disastrous impact on the economy. The destruction of the economic infrastructure and an acute shortage of imported inputs have caused a considerable decline of output and wage employment (especially in the private sector). The reduction of formal employment opportunities, and the general impoverishment of the population, have led to a large-scale expansion of "informal" self-employment (e.g. street-vending).

Overall, money earnings have remained more or less unchanged for the majority of the population since August 1990. Over the same period, consumer prices have sharply increased, due to trade restriction, exchange-rate depreciation and reductions in subsidies. The food price index has risen by 1,500 to 2,000 percent.

Correspondingly, real earnings have fallen to less than 7 per cent of their pre-crisis level, in terms of purchasing power over food. In terms of private incomes, the incidence of poverty is now greater in Iraq than in, say, India. The collapse of private incomes has been further aggravated by the deterioration of many basic public services.

These adverse development have been partly compensated by the expansion of public food distribution. Iraq's public distribution system, which covers all residents (except in areas not currently administered by the government, particularly the north), is equitable and efficient. However, food distribution covers at best one half of the nutritional needs of the population. Many households have to sell their assets to complement food rations with market purchases.

The paralysis of economic activity and basic public services, inadequately compensated by food rationing, has been one of the major causes of nutritional deprivation and enhanced mortality.

CHILD PSYCHOLOGY SURVEY

On the basis of in-depth interviews of 214 Iraqi children of primary school age, two professional child psychologists report levels of anxiety, stress, and pathological behavior unprecedented in their fifteen year experience in this field. For example, nearly two-thirds of children interviewed believe that they will not survive to become adults. Nearly eighty percent are afraid of losing her/his family through death or separation. Eighty percent experienced shelling at close distance. The researchers conclude that "the high proportion of affected children clearly calls for a substantial national and international response to provide the necessary technical, professional, and educational means ... to help these affected children."

WOMEN SURVEY

A report on the state of women was compiled by three researchers who conducted in-depth interviews with eighty Iraqi women. The collapsed Iraq economy has driven many families to poverty. Due to the sanctions and the damaged water and electricity infrastructure, as well as, fuel and food shortages, eighty per cent of women interviewed described a situation where the burden of their domestic responsibilities had increased significantly. Fifty seven per cent of the women reported suffering from health problems. The Iraqi people, especially the women, are overwhelmed by their daily struggle to provide for their children even the most basic needs of food and water. Many women are forced to sell their jewelry, and other household assets to raise money to buy food for their children. The crisis is worst in the case of vulnerable groups, such as widows, who do not have any personal assets to sell for food and other basic necessities.

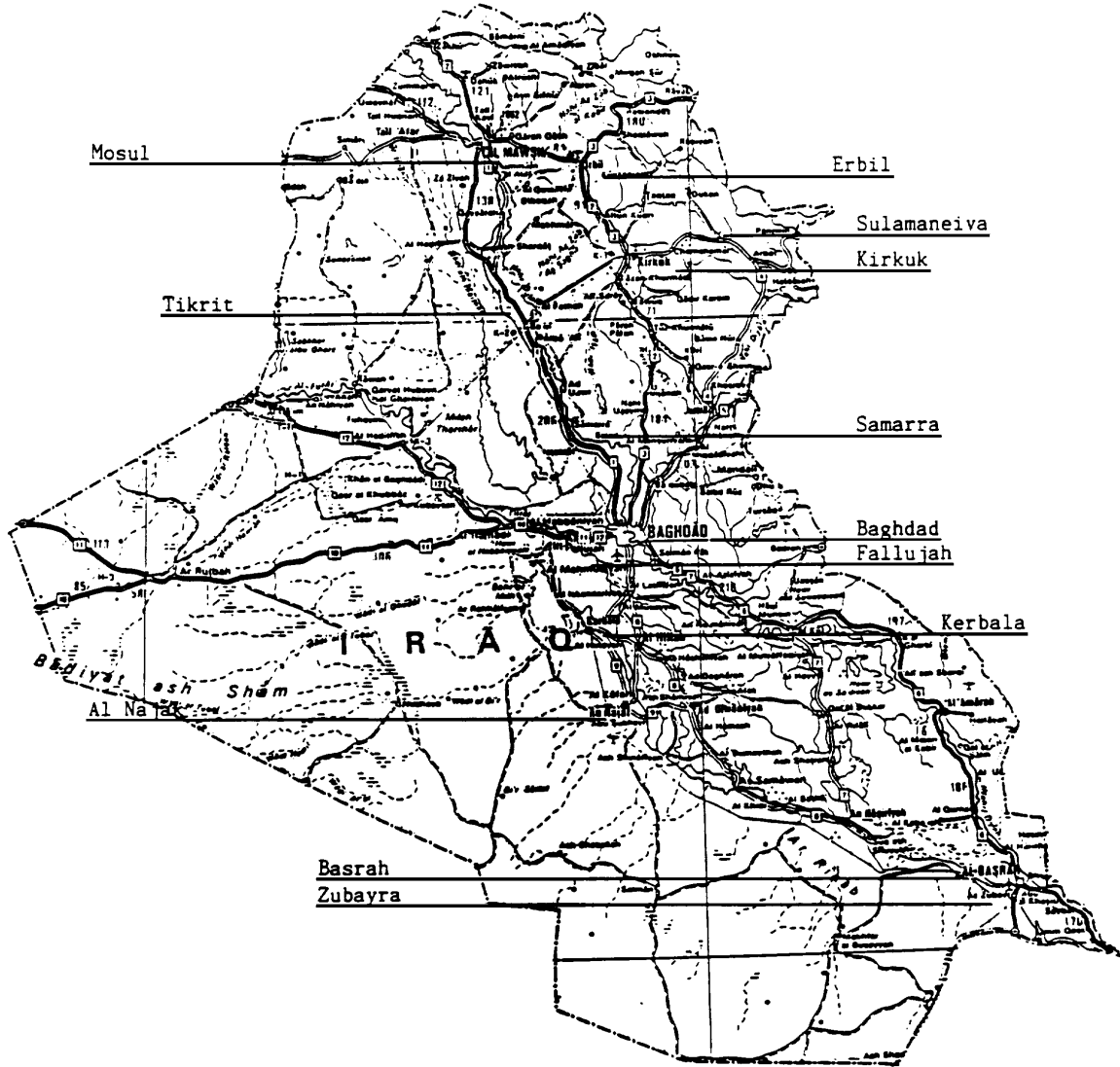


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CHILD MORTALITY AND NUTRITION SURVEY

A Public Health Study

October 1991

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1. **BACKGROUND** Conflict has long been recognized as unhealthy for children, and the combined effect of the Gulf war, civil unrest and economic sanctions, is no exception. To investigate the effects of these recent events on child health in Iraq, a team of public health professionals conducted a nationwide community-based survey of infant and under-five mortality rates, and childhood nutrition. The Child Mortality and Nutrition Survey was carried out between August 23 and September 5, 1991 and included more than 9,000 households.

2. **OBJECTIVES** The two main objectives of the household survey were to document:

(a) infant and under-five mortality rates during the eight month period from January to August 1991 compared with January to August 1990;

(b) nutritional status of children between three months and five years of age.

3. **DEFINITIONS**

Mortality

Infant mortality rate is the number of deaths in children under one year of age per 1,000 live births occurring during the same time period.¹

Under five mortality rate is the number of deaths in children under five years of age per 1,000 live births occurring during the same time period.

Nutritional status

Height-for-age is an indicator of “stunting” or “shortness”, and is generally attributed to malnutrition of a long-standing nature which is sufficient to interfere with linear growth.

Weight-for-age is an indicator of undernutrition resulting in reduced body mass caused by insufficient caloric intake (food shortage), or infections such as diarrhea.

Weight-for-height is an indicator of acute “wasting” caused by a food emergency with marked reduction in food availability or interference with utilization due to infection. An increase in weight-for-height malnutrition tends to be most sensitive to change during an acute famine, but if both height-for-age and weight-for-age are reduced this measure may appear relatively normal.

In order to judge the significance of particular levels of these nutritional indicators during an emergency one should use baseline levels for that population. We have not been able to find such information for Iraq.

Geographic boundaries

Baghdad refers to the current administrative boundaries of the governorate of Baghdad (including Baghdad city).

North refers to those governorates with administrative areas which lie north of Baghdad city. This includes the governorates of Dohuk, Ninevah, Erbil, Sulaimaniyah, al Tamim, al Anbar, Salah al Din and Diyala.

South refers to those governorates lying south of Baghdad city. This includes the governorates of Wasit, Babel, Maysan, Basrah, Dhi Qar, Qadisiyah, al Muthana, Najaf and Kerbala.

4. METHODS

- 4.1 Sampling Scheme and Sample Size The sampling frame used for the household survey was that obtained from the 1987 Census of Iraq. Adjustments were made for population displacements that had occurred as a result of the recent crisis. Up-to-date information regarding displacement (primarily in the governorates of Sulaimaniyah, Dohuk and Erbil) was provided by the United Nations in Baghdad.

Independent of Iraqi officials, 275 clusters (neighborhoods) of approximately 30 households each were randomly allocated to all 18 Iraqi governorates in a manner proportional to population.

Once governorate allocation had occurred, clusters were allocated to the urban and rural portions of the population, and finally to districts and sub-districts. Each step used random sampling that was proportional to population.

Within each cluster, one household was selected as the starting point for the survey (in accordance with standard selection techniques). Contiguous households were surveyed until a total of 25–30 households had been interviewed. In this manner, a total of 9,034 households were entered into the mortality survey. Approximately one-fifth of these households were selected for anthropometric measurement of all available children under five years of age.

Estimation of the required number of households (sample size) was based on a set of assumptions which would detect a 40 per cent increase in the infant mortality rate when comparing the most recent twelve month period with the twelve months immediately preceding. The baseline infant mortality rate used for sample size determination was that calculated by UNICEF (see Iraq Childhood Mortality Survey, 1990) and was estimated to be 41 deaths per thousand live births.² The sample size calculation assumed a crude birth rate of 40 per 1,000 population, an average household size of six, one responsive mother per household, a response rate of 80 per cent, and a design effect of two.

See (Appendix A.) for the total number of clusters sampled according to region within Iraq.

- 4.2 Questionnaire Within each sampled household, surveyors requested interviews with all women who were between 15 and 49 years of age and who had given birth within the past six years (January 1, 1985 to September 1, 1991). Eligible women, who consented to be enrolled in the study, were then interviewed.³

For practical purposes, the questionnaire can be divided into two parts. The first section was composed of questions concerning the mother: maternal age, education, reproductive history (number of children ever born and still alive), and the total number of live births over the past six years.

The second section of the questionnaire was concerned with children born during the previous six-year period. Information was collected concerning birth and death dates (day, month and year),⁴ as well as cause of death and point prevalence of diarrhea.⁵

A random selection of approximately 20 percent of the children recorded during the course of the study were also studied for nutritional status. Measurements were taken of weight and height in each of the clusters visited. Each survey team included at least one trained nutrition measurer who was accompanied by survey team members.⁶

See (Appendix B.) for a copy of the detailed questionnaire.

- 4.3 Survey Execution The questionnaire was pre-tested in Baghdad prior to the eight survey teams dispersing throughout the country. Each team consisted of a supervisor, three interviewers, and a nutrition measurer. Team supervisors were present in-the-field to address any difficulties concerning either the questionnaire or the measurements. Fieldwork began in Baghdad on August 25 and was completed on September 5.

Household interviews were conducted by 32 trained volunteers from Jordan. Interviewers and measurers were all university level students or graduates, and, with few exceptions, all female. Interviewers were bilingual in Arabic and English and some had previously conducted similar household surveys in Jordan. Training of interviewers and measurers was conducted both in Jordan and in Baghdad.

In order to conduct the survey in the Kurdish north, interpreters were recruited with the assistance of the United Nations High Commissioner for Refugees (UNHCR). Eight international supervisors, supported by two survey coordinators, directed the teams in the field and were responsible for final selection of clusters and households, editing, quality control, and data entry.

4.4 Data Entry and Analysis The following software was used for data entry and analysis:

- * EPI-INFO version 5.01 for data entry and analysis;
- * ANTHRO version 1.01 for computations of z-scores from the international reference of anthropometric indicators.

4.5 Collaboration Between Projects In addition to administering the survey questionnaire, team members assisted with two other community-based surveys. In coordination with the environmental group, a water sample was collected from each cluster to measure fecal coliform counts (see the Environmental Sector report). The child psychology team provided a “Trauma, separation and loss” psychological questionnaire which was administered to one randomly-selected household in each cluster (see the Child Psychology Survey).

5. FINDINGS

5.1 Data Description A total of 275 clusters containing 9,034 households were surveyed in the 18 governorates.

Data was collected on 16,314 births that occurred from August 1986 to September 1991. Only those births and deaths were included in the analysis, for which both month and year of birth and death were recorded. The final analysis included 15,028 live births, 507 infant deaths, and 599 deaths for children less than five years of age.

Anthropometric measurements were taken for approximately 20 per cent of the sample. A total of 2,902 children less than five years of age were measured for weight and height.

5.2.1 Infant Mortality Rate (IMR) (Table One) shows the survey results for the infant mortality rate (deaths in children under one year of age per 1,000 live births during the same time period).

Infant mortality rates remained fairly constant from 1987 to 1990, ranging from 19.7 to 29.5 deaths per thousand live births. However, when comparing January–August 1990 with January–August 1991, the infant mortality rate increased from 22.7 to 80.0 deaths per thousand live births.

Table One: National Infant Mortality Rate* (Iraq)
January – August

	<u>1991</u>	<u>1990</u>	<u>1989</u>	<u>1988</u>	<u>1987</u>
<u>Infant Mortality Rate</u>	80.0	22.7	19.7	29.5	26.5
<u>Total Livebirths</u>	2050	1939	1828	1730	1662

* Infant deaths per 1,000 live births

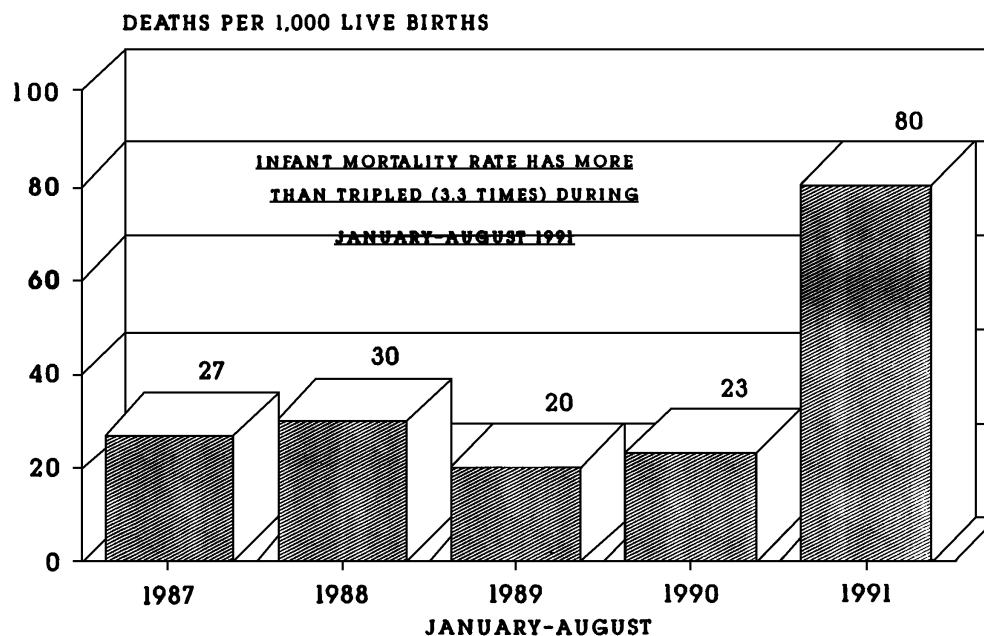
Calculating a weighted average of the 1987–1990 figures yields a baseline rate of 24.4 deaths per 1,000 live births. The January–August 1991 IMR is 330 percent (3.3 times) of this (1987–90) rate. When comparing January–August 1991 with January–August 1990, the IMR is 350 percent (3.5 times) of the baseline.

$\frac{\text{Infant Mortality Rate 1991}}{\text{Infant Mortality Rate 1987 – 1990}} = 3.3$
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Therefore, the IMR (nationally) has more than tripled during January–August 1991. This trend can be seen in (Figure One) on the following page.

This upward trend in infant mortality is also evident at the regional level. (Table Two) illustrates the regional variations in the IMR obtained from the survey.

**Figure 1. NATIONAL INFANT MORTALITY RATE
(CHILDREN UNDER 1 YEAR OF AGE)
JANUARY - AUGUST**



Iraq Household Survey, 1991

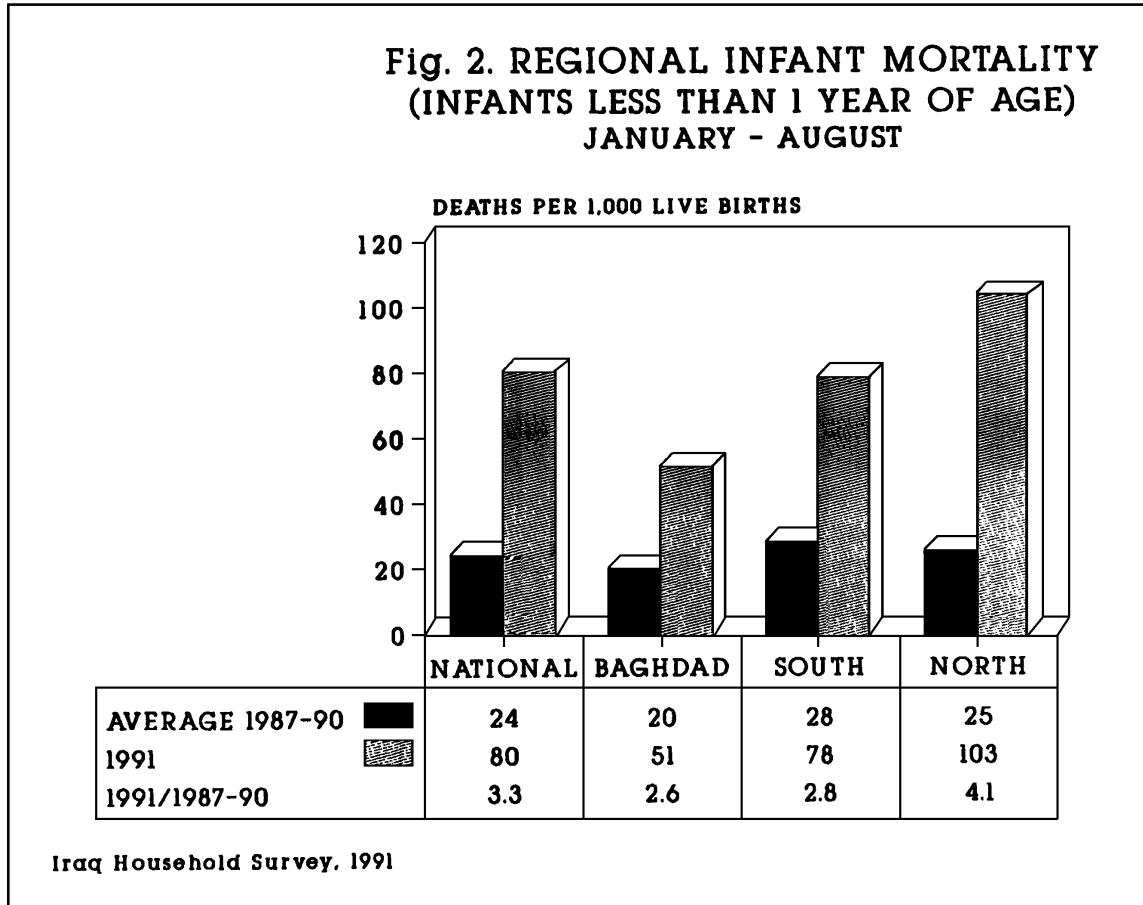
Table Two: Infant Mortality Rate (Regional)
January - August

	<u>1991</u>	<u>1990</u>	<u>1989</u>	<u>1988</u>	<u>1987</u>	<u>Avg. 1987 - 1990</u>	<u>1991 1987 - 90</u>
<u>Baghdad IMR</u> (livebirths)	51.1 (489)	17.4 (461)	28.8 (452)	15.2 (395)	17.8 (394)	19.8 (2191)	2.6
<u>North IMR</u> (livebirths)	102.8 (749)	24.0 (709)	14.1 (711)	39.5 (659)	23.1 (605)	25.2 (3433)	4.1
<u>South IMR</u> (livebirths)	78.4 (765)	26.7 (712)	21.1 (615)	29.6 (642)	34.4 (610)	28.0 (3340)	2.8

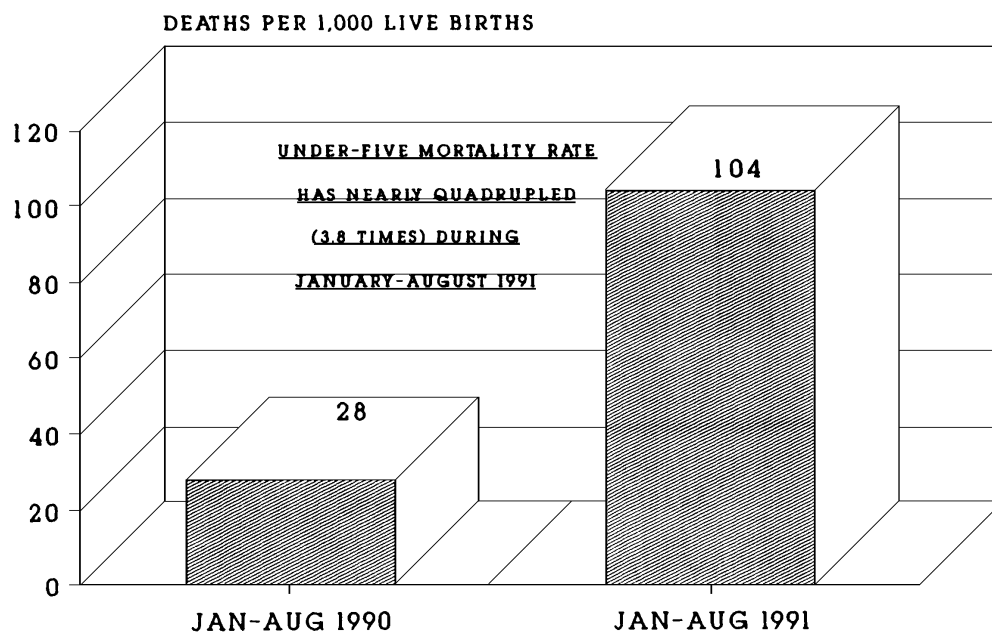
Results for Baghdad show a 2.6-fold increase in infant mortality during January-August, an increase from 19.8 deaths per thousand live births (average of 1987-1990 rates) to 51.1 deaths per thousand live births. In the northern governorates, infant mortality increased 4.1-fold, from 25.2 to 102.8 deaths per thousand live births. In the southern governorates, infant mortality increased 2.8-fold, from 28.0 to 78.4 deaths per thousand live births.

(Figure Two) illustrates the differences in regional calculations of infant mortality.

5.2.2 Under-Five Mortality Rate Similarly, the national underfive mortality rate for the same time period (January–August 1991), has increased to 380 percent of the baseline, rising from 27.8 in 1990 to 104.4 per 1,000 live births in 1991. (See Table Three and Figure Three).



**Figure 3. NATIONAL UNDER-FIVE MORTALITY
(CHILDREN UNDER 5 YEARS OF AGE)
JANUARY - AUGUST**



Iraq Household Survey, 1991

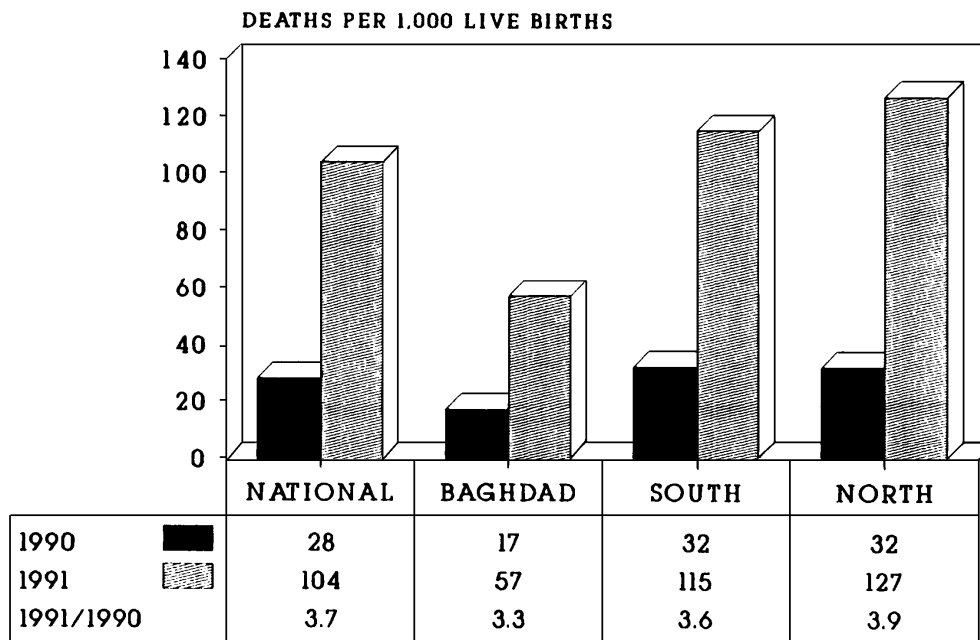
Table Three: National Under-Five Mortality Rate (Iraq)
January - August

	<u>1991</u>	<u>1990</u>	<u>1991</u> <u>1990</u>
<u>Under-5</u> <u>Mortality</u> <u>Rate</u>	104.4	27.8	3.8
<u>Total</u> <u>Livebirths</u>	2050	1939	N/A

Table Four and Figure Four illustrate a similar rise in under-five mortality rates at the regional level.

Results for Baghdad show a 3.3-fold increase in under-five child mortality rates during January to August 1991. This represents an increase from 17.4 deaths per thousand live births (January-August 1990) to 57.3 deaths per thousand live births. In the northern governorates, under-five mortality increased 3.9-fold, from 32.4 to 126.8 deaths per thousand live births. In the southern governorates, under-five mortality increased 3.6-fold, from 32.3 to 115.0 deaths per thousand live births.

**Figure 4. REGIONAL UNDER-FIVE MORTALITY
(CHILDREN UNDER FIVE YEARS)
JANUARY - AUGUST**



Iraq Household Survey, 1991

Table Four: Under-Five Mortality Rate (Regional)
January - August

	<u>1991</u>	<u>1990</u>	<u>1991</u> <u>1990</u>
<u>Baghdad</u> (livebirths)	57.3 (489)	17.4 (461)	3.3
<u>North</u>	126.8 (749)	32.4 (709)	3.9
<u>South</u>	115.0 (765)	32.3 (712)	3.6

DISCUSSION Infant and under-five mortality have risen dramatically in the first eight months of 1991, with infant mortality now 330 percent, and under-five mortality 380 percent of the baseline rates.

Because of the nature and sequence of health-influencing events occurring over the past 12 months (sanctions, war, civil disturbances), it is nearly impossible to separate the effect of one event from the others. Nonetheless, it can be clearly determined that the combination of these three have resulted in a marked deterioration in the state of health of the under-five population in Iraq.

The United Nations, and other independent sources, have documented the recent and critical shortages of essential drugs as well as the limited capacity of the Iraqi health system to treat childhood infections. Diarrheal disease, related to Iraq's inability to treat sewage, and the reduced ability to purify the population's water supply, has also increased. These two factors have likely contributed most significantly to the increase in mortality among children.

The North has shown greater increases in both infant and child deaths, suggesting that the forced migration of this population, coinciding with the civil uprisings, played a significant role in contributing to the overall childhood death rate. However, the civil uprisings alone cannot account for the whole nation's observed increase, given that Baghdad, which did not experience any civil disturbances, has also experienced an upward trend in infant and under-five mortality. The slightly smaller increase in infant and under-five mortality rates seen in Baghdad (when compared with the rest of the country) may be due, in part, to urban/rural differentials. One would expect a higher increase in the rate of illness and death in the more isolated and, under current circumstances, under-serviced rural parts of the country than in Baghdad, in most respects, an urban entity.

With regards to causation, the rise in infant and under-five mortality is likely due to a complex interaction between a number of health-influencing factors. It is worth mentioning that the acute shortage of infant formula, powdered milk, and essential medicines, as well as the rise in the price of food, may have contributed to this elevated risk of mortality among Iraq's children. The lack of clean drinking water together with poor sanitation also may have increased the risk of diarrheal disease and its complications, (see sector reports on Water and Sanitation and on Health Facilities).

5.3 Nutritional Status Analysis of the anthropometric data involved examining the following nutritional status indicators: height-for-age, weight-for-age, and weight-for-height. Children who were calculated to be two or more standard deviations below the median reference values of the World Health Organization international standards are considered to be malnourished.⁷

As mentioned earlier, height-for-age, weight-for-age, and weight-for-height reflect a continuum between long-term and short-term nutritional intake. Height-for-age generally reflects the cumulative effects of ongoing undernutrition. Weight-for-height is a sensitive indicator for acute malnutrition, reflecting recent changes in food intake. Where there are deficits of both weight and height, the percentage below the norm for weight-for-height may be relatively smaller than for the other two indicators.

(Table Five) shows the percentage of children at the national level who were classified as malnourished for each of these indicators.

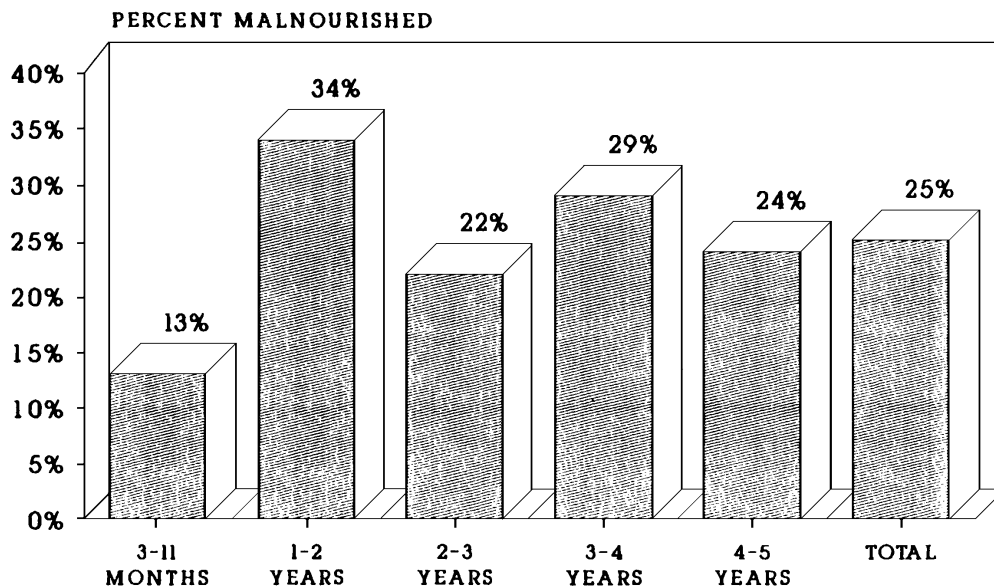
Table Five: Nutritional Status of Children Under Five – Iraq

<u>Age (yrs)</u>	<u>Height For age</u>	<u>Weight for age</u>	<u>Weight for height</u>
3 – 11 months	12.9%	10.8%	4.1%
1 – 2	34.0%	20.9%	5.3%
2 – 3	22.2%	14.8%	2.8%
3 – 4	28.8%	12.9%	2.5%
4 – 5	23.9%	10.2%	2.8%
<u>Total</u>	24.7%	14.2%	3.6%

Figure in box represents per cent malnutrition. Malnutrition is a value more than two standard deviations below the median reference value.

The previous table is represented diagrammatically in the three figures on the next page: (Figures Five, Six and Seven). A composite figure, (Figure Eight) combines all three anthropometric indicators.

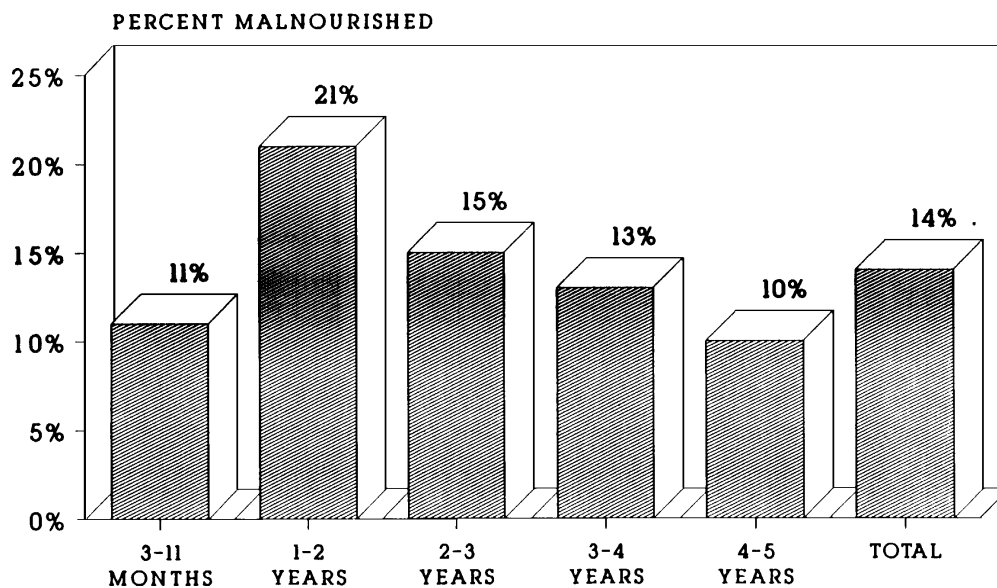
**Fig. 5. PERCENT OF CHILDREN MALNOURISHED
HEIGHT FOR AGE
(ACCORDING TO AGE GROUP)**



**MALNOURISHED - GREATER THAN 2 STANDARD
DEVIATIONS BELOW THE MEDIAN REF VALUES**

Iraq Household Survey, 1991

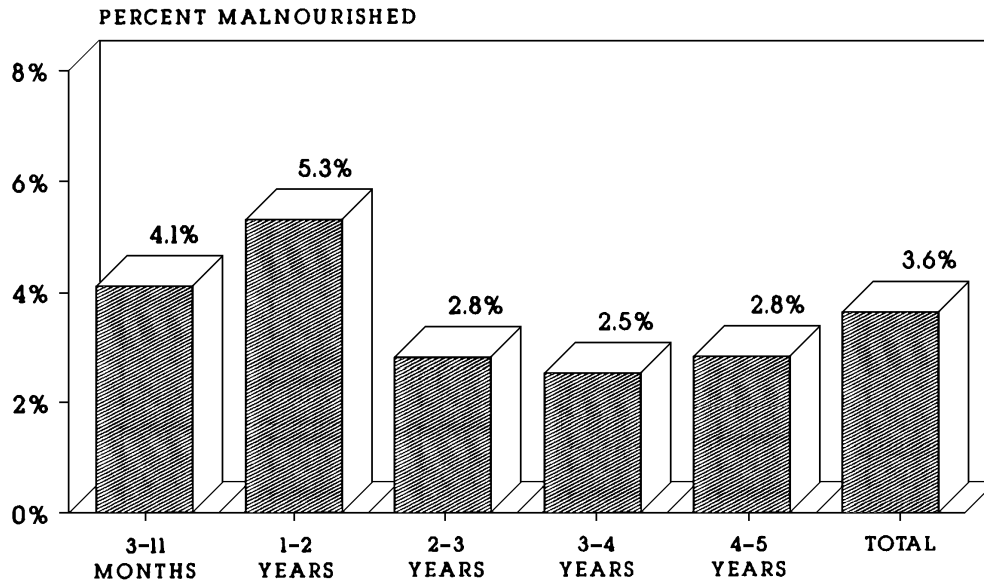
**Fig. 6. PERCENT OF CHILDREN MALNOURISHED
WEIGHT FOR AGE
(ACCORDING TO AGE GROUP)**



**MALNOURISHED - MORE THAN 2 STANDARD
DEVIATIONS BELOW THE MEDIAN REF VALUES**

Iraq Household Survey, 1991.

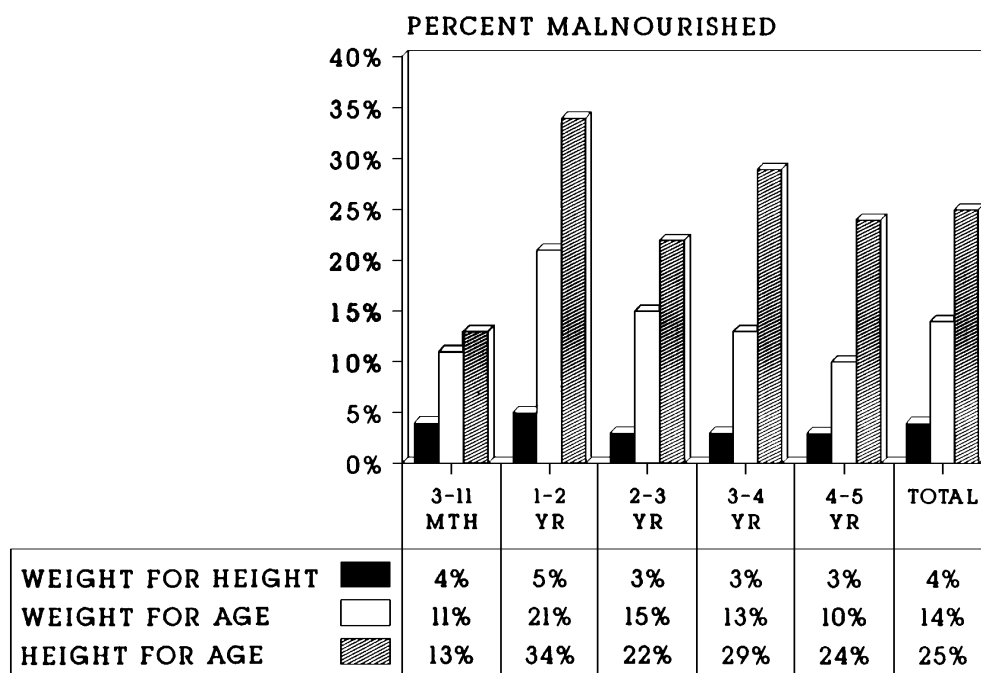
**Fig. 7. PERCENT OF CHILDREN MALNOURISHED
WEIGHT FOR HEIGHT
(ACCORDING TO AGE GROUP)**



MALNOURISHED - MORE THAN 2 STANDARD
DEVIATIONS BELOW THE REF VALUES

Iraq Household Survey, 1991

**Fig. 8. PERCENT OF CHILDREN MALNOURISHED
(ACCORDING TO AGE GROUP)**



Iraq Household Survey, 1991

DISCUSSION Overall, 28.8 percent of the children under the age of five were classified as malnourished by one or more of the three indicators. Applying this percentage to the 3.3 million children under the age of five in Iraq, there are 950,400, or nearly one million Iraqi children currently malnourished.

Nearly 25 per cent of children under the age of five were below the nutritional cutoff for height-for-age, reflecting longer-term undernutrition among these children. Fourteen per cent were below the cutoff for weight-for-age, and 3.6 percent for weight-for-height. Based on these results, it appears as if there is both longer-term malnutrition as well as a significant degree of ongoing under-nourishment. Unfortunately, we have no baseline data for comparison.

Height-for-age Height-for-age is an indicator of long-term malnutrition. Although the other measurements computed (weight-for-age and weight-for-height) would suggest that a continuing process of undernutrition is taking place, the figures for height-for-age (24.7 per cent more than two standard deviations below the median reference values) indicate that a component of the malnutrition being seen predates the current crisis.

Weight-for-age Of the sampled children, 14.2 per cent had values that were more than two standard deviations below the median reference value. This indicates ongoing undernutrition, which may be due to both reduced food intake and higher incidence of infectious disease (e.g. diarrheal disease), associated with the effects of the Gulf Crisis. Furthermore, the prevalence is significantly higher in the age group 1-2 years (20.9 per cent), the age group which has lived most of its post-weaning life under the combined burden of conflict and sanctions.

Weight-for-height The calculation of weight-for-height provides a good indicator of an extreme and very acute food deficit. In Iraq, the prevalence of moderate or severe acute (weight-for-height) malnutrition is 3.6 percent. These values should be interpreted in light of the possibility that the most severely malnourished children have already died. In addition, the highest prevalence occurs in children in the two youngest age groups. Among these children the prevalence of acute malnutrition is nearly twice as high as in the older age groups.

The results presented here suggest that children under the age of five in Iraq are receiving sufficient food to avoid acute starvation, but are still severely malnourished. Because there is no baseline data available, the results presented here cannot be compared to the situation prior to the current conflict. It is therefore not possible to determine whether the nutritional status of children has deteriorated since the beginning of the Gulf Crisis. However, these survey results will serve as a good baseline for future nutritional assessments.

Further Comments Anthropometric measurements indicate inadequate nutritional intake but cannot be used for predictive purposes. The present anthropometric data indicate a moderate to severely malnourished population with little reserve capacity to withstand food shortages. There is a synergistic relationship between malnutrition and infectious diseases, particularly diarrhea, whereby a malnourished child is more prone to contract the disease, and the disease process further exacerbates the malnutrition. It is quite possible that any further deterioration in nutritional status could result in an even greater increase in morbidity and mortality.

Finally, it is important to note that, for each of the above indices, the age group 1–2 years is the age group most-affected. They have lived most of their post-weaned lives under the effect of the sanctions and the war. Weaning is a particularly vulnerable time for these children as they are being exposed to many new pathogens in contaminated water and food, and their immune systems are still in the process of developing resistance to them.

- 5.4 Preliminary Status of the Findings This report includes a preliminary analysis of data collected in Iraq on mortality rates and nutritional status. (Subsequent analyses will be published in medical journals and will assess the importance of maternal education, sex differentials in both nutritional status and mortality, the prevalence of diarrheal disease, and patterns in both cause of death and age at death.)

For the mortality estimates we used a direct method of analysis, with a six year truncated birth history. This can result in an underestimation of mortality rates. Gathering full birth histories would have been prohibitively time-consuming given the time constraints under which we were working.

There are various ways by which nutritional data can be interpreted. In this interpretation of the results we have taken a conservative approach. The use of the WHO/CDC standards may result in underestimation of the level of malnutrition.

6. CONCLUSIONS

- ** Infant mortality has risen by 330 percent of its previous level (3.3 times), from January to August 1991, in comparison to the same time period in 1990. Under-five mortality has risen by 380 percent of its previous level (3.8 times) in the same time period.
- ** The rise in mortality is general across all regions. The northern areas seem to have experienced the largest rise in mortality (infant mortality ratio 1991/1990 = 4.1; under-five mortality ratio 1991/1990 = 3.9), however, each region has experienced a significant rise in both infant and under-five mortality.
- ** The nutritional status of children between 1 and 2 years of age has been severely affected when compared with other age groups. This is a sensitive period of growth which includes the weaning period. Our estimates of height-for-age and weight-for-age show significant levels of malnutrition for this age group which has lived most of its life under conditions of war, unrest, and sanctions.

APPENDIX A

Total Number of Clusters According to Governorate Urban, Rural and Total - Child Mortality and Nutrition Survey, 1991

GOVERNORATE	NUMBER OF CLUSTERS		
	URBAN	RURAL	TOTAL
al Anbar	6	8	14
Erbil	6	4	10
Babel	8	9	17
Baghdad	75	75	
Basrah	10	4	14
Diyala	7	9	16
Dohuk	4	2	6
Kerbala	5	3	8
Maysan	2	2	4
al Muthana	3	3	6
Najaf	8	3	11
Ninevah	7	9	16
Qadisiyah	6	4	10
Salah al Din	5	7	12
Sulamaneiya	3	8	11
al Tamim	9	-	9
Dhi Qar	7	9	16
Wasit	5	4	9
Non-governmental areas			11
Total Iraq	176	88	275

Childrens Health; p1658XStatus 1991

<u>Supervisor</u> _____	<u>Interviewer</u> _____	<u>Edit/Entry</u> _____
Govern ---	HH Status ---	Edit1 ---
PSU ---	HH Occupancy ---	
Urban/ ---	Available ---	Edit2/ ---
Rural ---	Eligible ---	Entry1 ---
SSU ---	Responsive ---	
Cluster ---	Visit 1 ---	
Househ # ---	Visit 2 ---	
	Final result ---	Entry2 ---
Interv ---		
Date ---		

#	Name	Date of Birth	Educ	Ever Live	Still Alive	6 yrs	#	Name	Sex	DOB	Asc Method	Still Alive	DD 43 hr	If here	Wt	Ht	Date of Death	Cause

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ENDNOTES:

¹ Newell, C. (1988) Methods and Models in Demography. Guildford Press, New York.

² UNICEF (1990) Iraq: Immunization Diarrhoeal Diseases, Maternal and Childhood Mortality Survey. Evaluation Series No. 9. Regional Office for the Middle East and North Africa, UNICEF.

³ Within each cluster, households in which eligible women were not available at the first visit were visited a second time while the team was in the neighborhood. Due to time limitations, the survey team did not return to the neighborhood for further visits. Understandably, this may introduce a biased response by excluding working women. However, field work began at 8 a.m. and continued until dusk, as well as over the weekend. Although not disallowing the possibility of such bias, it was felt that any such bias would be diminished by such actions.

⁴ When this was not possible, information regarding births and deaths was ascertained by month/year using the local Islamic calendar and local events. In this survey, 68 percent of the childrens' births were available from immunization cards, 23 percent of the mothers were able to provide day, month and year of birth, and a further 4 percent of the mothers were able to provide month and year. Five percent of the mothers were able to provide only the year or did not know, and were therefore not included in the results.

⁵ Diarrhea identified by the local colloquial as Ishal was defined by three or more loose and watery bowel motions per 24 hours, during the 48 hours prior to interview.

⁶ The anthropometric kits used were donated by Oxfam UK and included 25 and 50 kilogram weight CMS hanging scales, height and length boards.

⁷ The World Health Organization uses standards developed by the United States National Center for Health Statistics, Hyattsville, Maryland. These standards are the same as those incorporated into the computerized statistical programs used for the current analysis.

HEALTH FACILITIES SURVEY

by
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Elizabeth Benjamin
Ahmad Obeidat
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October 1991

HEALTH FACILITIES SURVEY
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- 5 Observations and Comments

1 SYNOPSIS The health of the Iraqi civilian population is compromised by a health delivery system that remains under siege due to precariously low levels of drugs and medical supplies.

Variations in climate and population displacement have created qualitative regional differences both in the disease burden and in the level of health care offered to the population. In the Kurdish north, persons displaced during the civil uprisings will require decent shelter, adequate nutrition and clean water to survive harsh winter conditions. In the southern areas, including Basrah, the extreme summer heat and badly polluted water systems enhanced the rapid transmission of water-borne communicable diseases to the pediatric population. The vastness of the south, as well as lagging international attention, may place the southern populations at a higher risk than those living in other areas of the country.

Throughout the country, strained health facilities offer services equivalent to a fraction of their pre-war levels. Most lack even the most basic resources -- medicines, anesthetics, syringes and surgical supplies are all in short supply. X-ray units, laboratories, neonatal units and operating theaters are either not functioning or are providing only limited services. Generally, antenatal care, supplementary feeding programs and outreach programs (including immunization) throughout the country remain insufficient at best, suspended at worst.

The health delivery system is also hampered by a lack of potable water and inadequate food supplies for the civilian population, despite minor improvements in the health infrastructure, including water supply, electricity and transportation, which have occurred over the past six months.

Water-borne diseases including typhoid, cholera, hepatitis, and other non-specific forms of gastroenteritis continue to thrive. Lack of immunization and poor sanitary conditions have resulted in outbreaks of previously uncommon, and completely preventable, childhood diseases such as poliomyelitis, measles and tetanus.

Finally, poor access to, and limited availability of, essential foodstuffs has resulted in detectable increases in the rates of malnutrition among children and anemia among pregnant women.

2 METHODOLOGY The Health Facility Team included five health experts -- two pediatricians, two public health specialists and one general practitioner. Three of the five team members are fluent Arabic speakers. Non-Arabic speaking team members hired independent translators referred by international agencies working in Iraq.

During the two week study period, all work was carried out in an independent and unobstructed manner. Team members had unlimited access to all facilities and geographic areas. In the UN-supervised Kurdish areas of northern Iraq, the team borrowed United Nations vehicles.

Over a period of two weeks, the study team visited a total of 29 hospitals and 17 health centers in 16 out of 18 total governorates in Iraq.

The study team's methodology consisted of three components: (1) ward-based disease and nutrition prevalence studies of admitted pediatric patients; (2) a structured interview with the director at each facility, using a pre-standardized questionnaire (if the director was unavailable, the department heads or the physician in charge of a given pediatric ward were interviewed) and (3) medical and hospital record analysis. Whenever time permitted, the study team met with other available health and administrative personnel and inspected medical, supply and maintenance departments to assess the facilities' functional capacities. Patients and relatives were also randomly interviewed.

2.1 Hospital Ward-Based Prevalence Survey The first component, the hospital ward-based disease and nutrition prevalence study, was designed to determine the disease burden carried by pediatric patients under the age of five, by age and sex in Iraqi Hospitals. The ward prevalence studies are designed to capture changes in hospital-based disease patterns as certain conditions, specifically climate and medical supplies, change.

In most hospitals all eligible in-patients were examined. In a few hospitals, due to time constraints, the team randomly sampled selected in-patients. Data from hospitals with less than 20 patients was discarded as under-representative.

In each hospital visited, the team documented the following information for the selected patients: age (in months for 0 to 12 months, in years for 1 to 4 years); gender; admission diagnosis; and presence or absence of severe malnutrition. Criteria for inclusion in the study were as follows: age five years or less; inpatient in the hospital for a medical cause (as opposed to a surgical cause); and not an inpatient in a special unit (neonatal special care, intensive care, hematology or renal).

Two methods were used to assess nutritional status. First, all patients less than one year were weighed with our own scales. Second, for children aged 12 months and older, the team measured the mid-upper arm circumference. Each child's age, gender and admissions diagnosis were entered into survey forms for the sample site. Children falling into two standard deviations below normal weight for age were defined as severely malnourished.

2.2 Operating Capacity Survey The second study consisted of the administration of a standardized questionnaire to the heads of the hospitals and health centers visited by the team. The questionnaire is designed to capture the operating capacity of each of the facilities surveyed compared to pre-war levels, as well as levels observed directly after the conflict.

2.3 Hospital and Community Health Facility Records The third study component analyzed hospital and community health facility records. Often, records were found to be kept in a haphazard fashion. Additionally, many facilities' records were damaged in the war and subsequent uprising and remain in disarray. The team was forced to collect different types of data from the various sites investigated. This obviously makes comparisons difficult. Nevertheless, the study team collected data which seemed appropriate and discarded data that was of questionable quality.

2.6 Other Sources Verbal and written reports on civilian health status, the health care delivery system and relief operations were collected from officials of non-governmental organizations (NGOs) and United Nations representatives including: Medecin Sans Frontieres (Doctors Without Borders); Save the Children (UK); Catholic Relief Services; International Committee of the Red Cross; United Nations Children's Defense Fund; United Nations High Commissioner for Refugees; and the World Health Organization.

Finally, the team also interviewed Iraqi Ministry of Health officials at central, governorate and district levels. Charts derived from Ministry of Health records at the national and local levels are presented at the end of this report.

3 FINDINGS

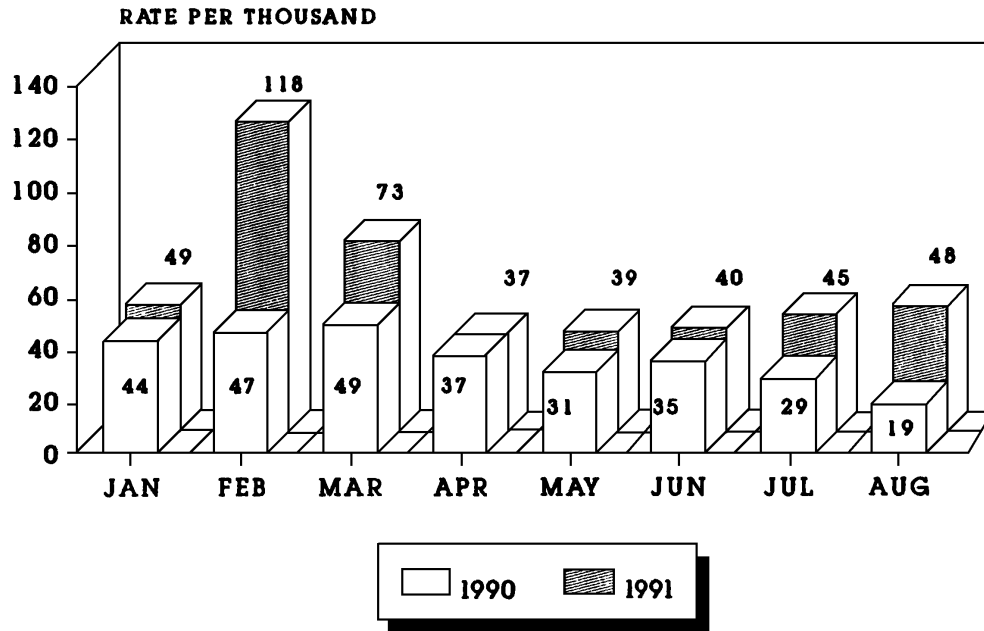
3.1 Hospital Mortality Increased incidence of disease, inadequate health services due to shortages of drugs, supplies, food, electricity and clean water, as well as the effects of the extreme summer heat, have likely all contributed to an increase in Iraq's overall child mortality rate.

However, an accurate hospital mortality assessment is difficult to determine for several reasons. First, many deaths occur in the community before the children reach the hospital. During the war, this was predominately due to difficulty in transportation. After the war, as supply shortages became a well-publicized problem, many families ceased to admit their children as patients. Second, many Iraqi physicians reported that the conditions in the facilities had deteriorated to such an extent that they discontinued admitting patients because they considered the risk of potential cross-infection within the ward populations to outweigh the benefits of admission.

The Medical Director, Dr. Bushar, of Ibn al Athir Pediatric Hospital in Mosul had calculated his in-patient under-five mortality rate for the months January–August 1990 and 1991. **Figure One** illustrates that the peak mortality rate occurred during and immediately following the conflict. It increased to almost 1.6

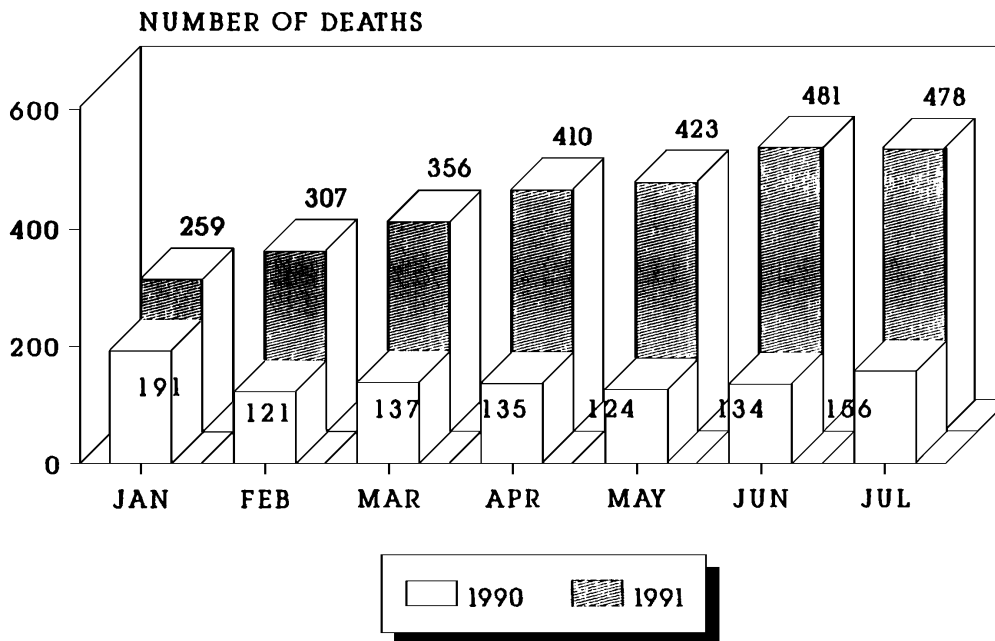
times the rate for the same period in 1990.

**Figure 1 REPORTED IN-PATIENT MORTALITY
RATE OF CHILDREN UNDER FIVE YEARS OF AGE
IBN AL ATHIR HOSPITAL, MOSUL**



SOURCE: IBN AL ATHIR HOSPITAL, MOSUL

**Figure 2 REPORTED IN-HOSPITAL DEATHS
OF CHILDREN UNDER FIVE YEARS OF AGE
BASRAH GOVERNORATE (JAN-JULY 1990/91)**



SOURCE: MINISTRY OF HEALTH. BASRAH

In Basrah, the increase in under five mortality is even more dramatic. **Figure Two** illustrates the reported increase in child mortality during the first seven months of 1991. The average monthly mortality increased 2.8 fold in 1991 over the previous year.

Similarly, data collected at Babel Pediatric Hospital reveals an increase in mortality by a factor of 3.9 for the first seven months of 1991 over 1990.

In Diwaniya, the hospital records showed only a slight increase in mortality for the same period. There were a total of 394 deaths in 1991 compared to 321 in 1990, an increase of about 1.2 fold. Hospital interviews with physicians and statisticians told the Facility Team that this small increase in hospital mortality is not representative of the community death rate. Severe shortages of medicines and food in the hospital are well known throughout the community. In addition, irreparable hospital air conditioning units and mobile health clinics have deterred local residents from seeking care.

A comparison of 1990 and 1991 recorded deaths at Khadmiya Hospital, located in a lower income Shi'i neighborhood in Baghdad, indicated a marked increase in mortality during February, March, and April of 1991 in both hospital and home deaths reported to the hospital. In February, 1991 the number of hospital deaths were three and a half times higher than the previous year. Similarly, the number of pediatric home deaths in the community surrounding Khadmiya Hospital was also three times higher during the same period. This pattern continued for another month and subsequently stabilized by May, 1991.

The situation at Khadmiya Hospital and in the surrounding community has dramatically improved in the past three months. The Medical Director, Dr. al Salawan, told the Facility Team that gastroenteritis, due to polluted water supplies, was the major cause of death during February through April, 1991. With the

improvement in Baghdad's water supplies over the summer, the pattern of communicable diseases, still rampant in other parts of the country, has diminished. According to Dr. Al Salawan, the death rates for both hospital and home for May, June, and July, are nearly identical.

While the spring and summer admission rates for Sulamaneiya Pediatric Hospital were much higher in 1991 than in 1990 (often double), the hospital mortality rates remained relatively stable. For example, during April–July, 1990, the average mortality rate was 15.8 per thousand patients. For the same period in 1991, the average mortality rate was 14.8 per thousand patients.

At Sulamaneiya Pediatric Hospital, the number of gastroenteritis and malnutrition deaths for the months January–July, 1990 were 117 out of a total 7,793 admissions. In contrast, in 1991 there were 134 deaths out of only 5,692 admissions.¹ Thus, in this region, the gastroenteritis and malnutrition fatality rates appear to be higher this year than last. Physicians at Sulamaneiya Hospital attributed the higher fatality rates to a lack of safe water and inadequate food supplies which marked the exodus from the civil unrest occurring in March and April, 1991, as well as the overall affects of the war.

3.2 Morbidity For the time being, the morbidity patterns in southern Iraq remain significantly more acute than in northern Iraq. This is especially true in the rural areas, away from urban centers. For example, in northern Iraq, a review of hospital records suggests that the summer disease cycle peaked during May and June and that in-patient morbidity and mortality have decreased in many areas; although levels of disease remain well above 1990 levels. In the southern governorates, there is absolutely no evidence to suggest that morbidity is decreasing. Disease patterns remain at epidemic proportions.

An exception to the above situation in the north concerns displaced individuals (returnees) who are camped on the remains of destroyed villages east of Sulamaneiya, near the Iranian border. This situation is precarious due to the lack of adequate shelter and poor access to clean water. Furthermore, the returnee population will soon be exposed to the harsh climate of winter and patterns of disease associated with cold temperatures and exposure.

3.2.1 Gastroenteritis Gastroenteritis remains a significant inpatient problem in post-war Iraq. In the north, the prevalence of gastroenteritis in the Sulamaneiya Pediatric, Mosul's Ibn Al Athir Pediatric, Ramadi Maternity and Pediatric, Erbil Maternity and Pediatric and Baghdad's Al Khadmiya Hospitals were 78%, 69%, 53%, 50% and 47% respectively. In the south, the disease prevalence of gastroenteritis in Amarra's Saddam General, Basrah's Al Tahreer, Basrah General, Diwaniya Maternity and Pediatric and Al Joumhuri Infectious Disease Hospitals were 50%, 50%, 48%, 46%, 44%, 32%, 30% respectively.

In addition to hospitals, a high prevalence of gastroenteritis was also documented in numerous health centers. For example, at Gharraf health center in Nassiria, the Facility Team documented a severe outbreak of gastroenteritis with 603 cases seen in the month of June, 1991 compared to 63 during the same period the previous year. Further, at Summer Health Center in al-Nassiria city, Dr. Abdel Fatah Khalek together with the statistician showed us records indicating that 30% of the children under five who came to the hospital had gastroenteritis.

3.2.2 Malnutrition Malnutrition is perhaps the most significant problem documented by the Facility Team in the in-patient prevalence studies. The northern team documented prevalence of severe malnutrition at Erbil Maternity and Pediatric, Sulamaneiya Pediatric, Mosul's Ibn Al Athir Hospital, Ramadi Maternity and Pediatric and Baghdad's Al Khadmiya to be 71%, 66%, 66%, 61%, and 20% of all in-patients respectively.

The southern team found the ward prevalence of severe malnutrition in Amarra's Saddam General, Baghdad's Ghadissiya General, Basrah General, Kut's Saddam General Hospital to be 54%, 41%, 38%, 32% respectively.

Iraqi physicians interviewed by the Facility Team stated that malnutrition had been uncommon among their pediatric patients in the last decade. One surgeon, Dr. Najib Sleah, the Director of Saddam Hussein Hospital in Amarra, was taught in medical school in Baghdad that the last documented case of Kwashiorkor

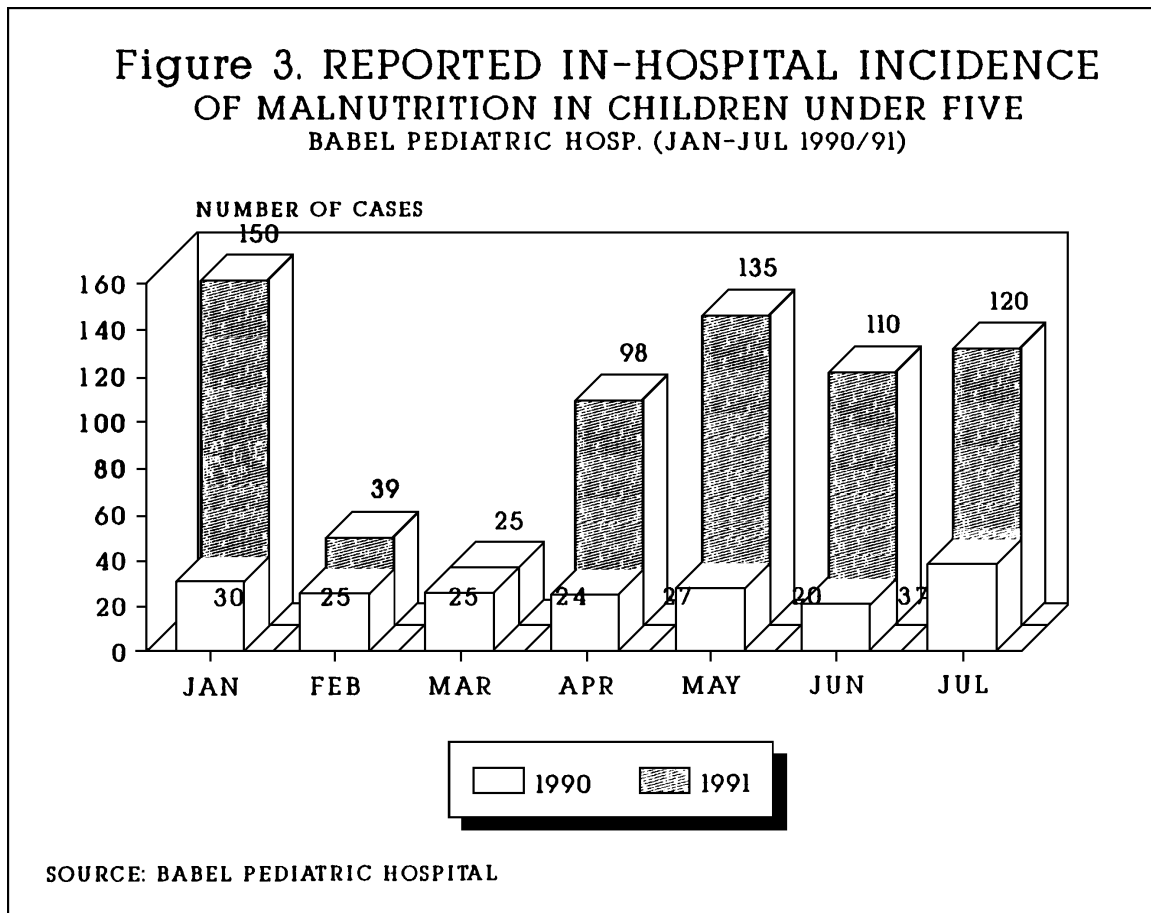
was in 1959.

Figure Three compares, for Babel Pediatric Hospital, the number of admissions for malnutrition during the first seven months of 1991 with similar admissions during the equivalent period of time in 1990. On average, the level of malnutrition in pediatric patients increased 3.6 fold. The dramatic decrease in cases of malnutrition during February/March was reportedly due to hospital closure during the conflict and civil disturbances.

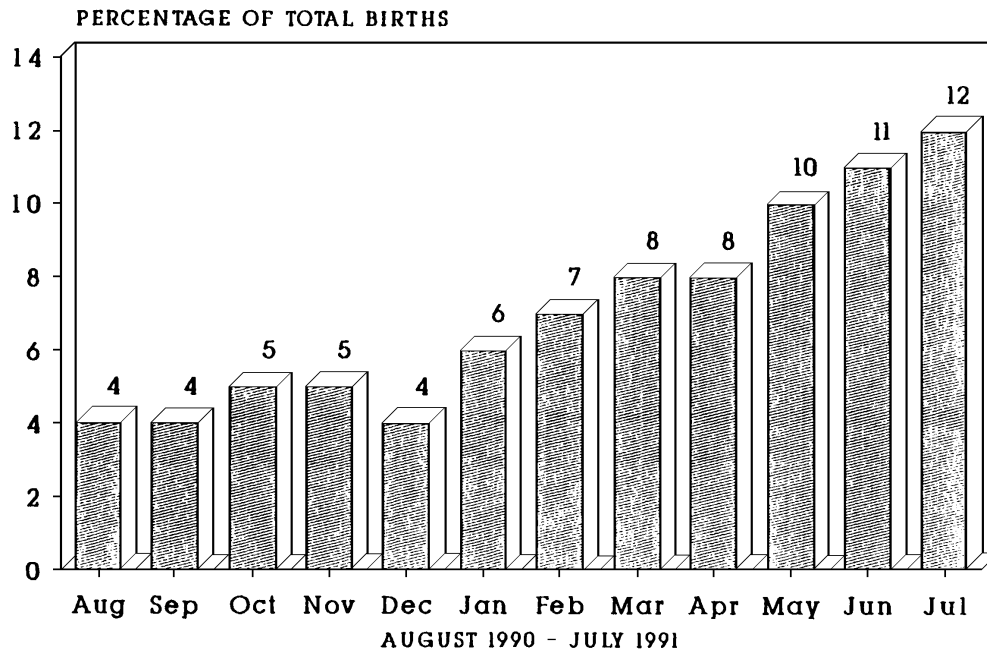
Food shortages and frequent gastroenteritis have contributed to high levels of malnutrition compared to the previous year. In Saddam General Hospital in Amarra, of the 600 patients admitted in June 1990, 200 were malnourished with no cases of Kwashikor. In June 1991, of the 500 patients admitted, 420 were malnourished with 15 cases of Kwashikor--a two-fold increase in malnutrition over the previous year.

The shortage of food supplies and subsequent malnutrition may, in part, be evidenced by the large increase in the numbers of low birth weight babies. In Kut, at Saddam General Hospital's neonatal unit, Dr. Faiza Ibrahim documented low birth weight babies to be 30-50% of all live births thus far in 1991, as compared to 12-14% for the same period in 1990. He attributed this jump to the lack of oxygen in the delivery room, poor maternal nutrition, physiological effects of the war and uprisings, and a lack of electricity to control room temperatures.

Figure Four illustrates the reported increase in babies weighing less than 2.5 kilograms (low birth weight) delivered in Iraqi health facilities. Moreover, the shortage and expense of infant formula and powdered milk, has forced many mothers to resort to feeding their children with water mixed with bread, sugar or flour. Lack of suitable infant food, in conjunction with unsafe drinking water, has led to high rates of diarrhea and malnutrition, exacerbating existing medical conditions.



**Figure 4. LOW BIRTH WEIGHT BABIES
 (<2.5KG) AS PERCENTAGE OF TOTAL BIRTHS
 REPORTED IN IRAQI HEALTH FACILITIES**



SOURCE: MINISTRY OF HEALTH, BAGHDAD

Infant formula now costs 11–18 dinars on the open market. This represents an increase of 2–3000 percent since August 1990 when the price was 0.6 dinars per three day's supply.

The average salary in Iraq is 120 dinars per month. This wage will supply one child with 3–4 weeks of infant formula provided the rest of the family does not eat.

3.2.3 Typhoid Typhoid remains impossible to confirm by laboratory diagnosis because of the lack of reagents throughout Iraq. Nevertheless, clinical diagnosis and subsequent treatment is common. In Kut's Al Joumhuri Infectious Disease, Ramadi Maternity and Pediatric, Basrah General, Erbil Maternity and Pediatric, and Sulamaneiya Pediatric Hospitals the prevalence of typhoid was found to be 30%, 22%, 20%, 7% and 6% of all in-patients respectively.

Table One: Increase Typhoid Admissions in Al Nassiriya and Babel Pediatric Hospitals

	Al Nassiriya Pediatric		Babel Pediatric	
	1990	1991	1990	1991
Jan	0	0	1	5
Feb	3	10	2	8
Mar	8	25	2	10
Apr	15	40	0	5
May	12	35	1	4
Jun	25	60	0	3
Jul	20	65	0	4

3.2.4 Meningitis The Facility Team documented a significant number of meningitis cases in the infectious disease wards and hospitals visited in the south, but found very few cases in Baghdad or the north, with the sole exception of Erbil. In the infectious disease ward of Basrah General, al Kut's Jounhori, and Erbil Maternity and Pediatric Hospitals the prevalence of meningitis was 33%, 30%, and 6% of all in-patients respectively.

Due to time limitations, the team was unable to carry out a systematic survey of infectious disease hospitals where most cases of meningitis are generally referred. Thus, the team was unable to capture a comprehensive assessment of meningitis in Iraq during the study period.

3.2.5 Hepatitis The study team documented cases of infectious hepatitis throughout Iraq. Hepatitis A was documented in Ramadi, Samarra, Mosul, Rania, Erbil, Takrit, Nassiria, Diwaniya, Hilla, Kerbala, and Basrah. In Gharraf Health Center, Nassiria, Dr. Hazim Al-Nassiry, the director of the Center, showed us records indicating that 25% of the people visiting the health center had clinical hepatitis. During his two-year employment at the health center before the war, he had only seen two cases of hepatitis. In al Hassan al Basri Health Center, Basrah, Dr. Ali Askar estimated that the incidence of Hepatitis had increased six times since the previous year.

3.2.6 Vaccine Preventable Diseases Many physicians interviewed by the Facility Team reported an increase in vaccine-preventable diseases. For example, at Summer Health Center in al-Nassiria city, the health records were reviewed for the previous three years. During the time prior to the month of July 1991, this health center had not seen any cases of polio; in July of 1991, five cases were seen.

Measles are now reported in Nassiriya and Babel Pediatric Hospitals. The increased measles' admissions, described in Figure Five below, is of concern because of the rapid transmission rates of this disease in an especially vulnerable and unvaccinated pediatric population.

Table Two: Incidence of Measles Admissions in Al Nassiriya and Babel Pediatric Hospitals

	Al Nassiriya Pediatric		Babel Pediatric	
	1990	1991	1990	1991
Jan	N/A	N/A	0	5
Feb	3	10	0	7
Mar	1	4	2	10
Apr	0	2	2	12
May	0	3	1	7
Jun	1	5	2	10
Jul	0	3	1	6

Dr. Mohammed al Hani, the national director of Iraq's Expanded Program on Immunization (EPI), told the Facility Team that, during August 1991, twelve cases of polio had been reported to the central Ministry of Health. According to the Ministry, this was equal to the total recorded incidence during 1990. In Basrah, 6 cases of polio were reported during the second week in August.

3.2.7 Reproductive Health Another important area is women's reproductive health. Reportedly, many women suffered from miscarriages during the war and the ensuing civil disturbances. Due to the breakdown in health services, these women were often treated inadequately or not at all and, therefore, continue to have problems with their health. Anemia is common among pregnant women due to poor nutrition.

Doctors at Babel Maternity Hospital reported that the number of miscarriages, premature labor and low birth weight babies has increased significantly since before the war.

4 FUNCTIONAL CAPACITY

4.1 Overview Despite a basically intact physical infrastructure, the ability of the health care system to function effectively has been drastically reduced. A lack of inputs (medicines and supplies), shortages of available transportation (ambulances and support vehicles), lack of communication and surveillance, and an unprecedented disease burden has left most health facilities unable to serve the communities in which they are located.

Damage to hospital wards, shortages of equipment, medicines, and personnel substantially reduce the functional capacity of health facilities in Iraq. In many instances, hospital wards have had to close.

The destruction and theft of hospital vehicles, including ambulances, has severely impaired the country's referral system as well as its rural mobile health care system. In Basrah alone, the Ministry of Health told the southern Facility Team that 82 ambulances were destroyed during the war and civil disturbances that followed.

4.2 Drugs and Medical Supplies The Facility Team found serious and widespread shortages of virtually all medicines and essential supplies in all of the hospitals surveyed. The increased incidence of infectious disease places an immense demand on the health services for antibiotics and other treatment regimens. Many physicians told the team, drug shortages dictate that only one or two days worth of medicines can be prescribed out of what is normally a seven-day treatment regime.

The most commonly described shortages included the most basic of drugs and supplies, including: antibiotics, disposable syringes, canulas, nitrous oxide and IV solutions. Even centers providing simple remedies such as Oral Rehydration Therapy² were closed in Kut and Basrah.

Some of the badly needed medicines and medical supplies includes:

- All antibiotics
 - especially chloramphenicol for typhoid
 - metronidazole for dysentery
- Analgesics, antiseptics
- Anesthetics – especially nitrous oxide
- Intravenous replacement fluids
- Disposable syringes, needles, infusion kits
- disposable gloves, gauze, cotton

The Ministry of Health reported to the Facility Team that the total quantity of medicines supplied to Iraq from august 1990 to July 1991 represents less than 10 percent of civilian requirements (based on pre-war consumption).

The United Nations, in a report by Sadruddin aga Khan, places this estimate closer to 35 percent. This figure is based on an estimated annual need of US \$360 million (1989), with input less than US \$50 million in January–July 1991.

The ability to conduct emergency surgery is compromised by shortages of surgical supplies and anesthetics. At the time of the Facility Team's visit, an acute shortage of nitrous oxide (for general anaesthetic) was reported in many localities.

All non-emergency, elective surgery has been suspended since shortly after August 1990. Operating room conditions are poor with acute shortages of anesthetics, antibiotics, painkillers and intravenous fluids. Surgical instruments and supplies are often damaged or lacking.

In many of the areas visited by the Facility Team, medical supplies and equipment have become so scarce that health workers are forced to re-sterilize and re-use disposable syringes, needles, cannulas and other single-use supplies. In Ramadi Maternity and Pediatric as well as al Khadmiya Pediatric Hospitals, resident physicians were discovered preserving one lone cannula from shift to shift in the event that an extremely desperate patient was admitted.

Many of the hospitals had no cleaning/sterilization materials. In contravention with standard medical procedures, surgical gloves are reportedly often used three or four times on different patients before being discarded. In northern Iraq, no antiseptic solution was available at any of the hospitals visited by the team. Both Ramadi and Mosul hospitals were unable to provide sheets for patients because of the lack of detergent.

The provision of food to hospitals is a vital part of rehabilitative care. In most hospitals, food rations are allocated to provide one-half the daily recommended emergency ration level. In al Hilla, a severe shortage of hospital food forced the Maternity and Pediatric Hospital to request that families of patients provide out-of-hospital food for their hospitalized relatives.

In nearly all sites visited by the Facility Team, infant feeding centers at hospitals and health centers remained closed due to lack of supplies.

4.3 Immunization Before the war, nearly 90 percent of Iraq's children were fully immunized.³ Shortly after the onset of war, disruption of the electrical system destroyed most stores of vaccines. After a gap of two to three months, fresh vaccines (in small quantities) were imported by international agencies.

Over the summer months, fluctuations in electrical current destroyed the compressors responsible for maintaining the central vaccine cold storage in Baghdad. As a result, until new compressors arrive from abroad, vaccine storage remains inadequate and precarious.

An effective immunization program is vitally dependent on a functional 'cold chain' system - that is, a reliable means of ensuring that all vaccines are stored under appropriate cooled or frozen conditions. Although a system is gradually being set up whereby individual hospitals will possess kerosene refrigerators and ice-lined freezers, in many health facilities the system is not yet functioning, vaccines are periodically lacking, and the delivery of vaccines is sporadic, at best.

The national director of Iraq's Expanded Program on Immunization (EPI) reported that as early as September 1990, adjustments to Iraq's child immunization program were necessary due to shortages of vaccines and injection materials. According to EPI officials, in late 1990 a decision was made to forego giving routine booster doses of polio and diphtheria/pertussis/tetanus (DPT) vaccines.

Detailed Ministry of Health records show that EPI vaccine delivery during January 1991 was roughly 10 percent of that administered during January 1990.

During the war itself, and until April/May 1991, Iraq's immunization program was virtually halted.

Although most functioning hospitals now maintain a basic stock of vaccines, many peripheral health centers lack either the vaccines or the means to deliver them safely. As mentioned above, syringes, needles and sterilizing alcohol are in short supply throughout the country and are commonly re-used between patients, potentially increasing transmission rates of communicable diseases.

As a result of the acute shortage of vaccines, the interrupted delivery of vaccine beginning even before the war, and the paralysis of the health care system arresting vaccine delivery for nearly four months, increases in vaccine-preventable diseases have already been detected (See Section 3.2).

4.4 Diagnostic and Medical Equipment The Facility Team found laboratories to be functioning at a diminished capacity due to supply shortages in all of the hospitals visited.

The disruption of the supply of electricity during the war incapacitated hospital laboratories. Refrigerated reagents and chemicals were spoiled, sensitive instruments were damaged due to fluctuations in electrical current and voltage, and tests requiring constant supply of electricity for incubation became impossible. In addition, in cities affected by the civil disturbances that followed the war, laboratory equipment was often vandalized, stolen and damaged.

All hospitals visited by the Facility Team reported laboratories to be functioning at a diminished capacity (on average less than 29.83%) due to shortages reagents and equipment failure.

Hospital laboratories are functioning at only a fraction of their pre-war capacity. Reagents were destroyed during the war due to lack of refrigeration and most are still unavailable. Sensitive equipment was stolen during the civil disturbances or damaged by fluctuations in electricity. Most laboratories visited were capable of carrying out only the most basic medical tests (hemoglobin, stool and urine examinations). Simple tests for blood sugar or electrolytes require referral to more centralized teaching hospitals.

All hospitals, except Sulamaneiya reported diminished X-ray facilities. Baghdad, Samarra, Mosul reported

40%, 30% and 60% of prewar Xray functioning. Tikrit General Hospital reported Barium shortages required for conducting X-rays. Erbil Maternity and Children's Hospital reported film shortages. Samarra General Hospital showed the study team members expired X-ray film provided by the Ministry of Health. In both Basrah General and Diwaniya Maternity and Pediatric Hospitals, the chief pharmacists showed the facility team donated drugs which had already expired before their arrival.

4.5 Health Personnel

Hospitals visited by the Health Facility Team generally indicated that they were now being staffed by adequate numbers of health personnel - the exception being specialized nursing staff.

Many specific instances of acute shortages of specialized nursing staff were documented by Facility Team members. Hospitals in Samarra, Ramadi and Tikrit were forced to close neonatal intensive care units due to staff shortages of specialized nurses. This shortfall is due to the exodus of large numbers of foreign medical personnel prior to January 1991. In Amarra 70% of the nurses left during the Gulf Crisis. Hospitals visited in Baghdad also reported a shortage of specialized nursing staff.

In Dahouk and Sulamaneiya Governorate, non-Kurdish Iraqi health personnel were reported to be unwilling to work outside of urban hospitals for fear of reprisals against them. Partly for this reason, a number of rural health centers remain either understaffed or closed.

Overall, apart from the above-mentioned shortages of specialized (generally surgical and intensive care) nurses, staffing does not appear to be a severe constraint to hospital functioning.

4.6 Physical Plant and Water Quality The war and the subsequent civil uprisings caused considerable structural damage to hospitals and other health facilities. The main Teaching Hospital in Basrah was badly damaged during the war. Four wards in the Saddam Hospital in Amarra remain closed as a result of the bombing. The Al Zubair Hospital, 20 kilometers from Basrah, has been completely destroyed due to a combination of bombing and civil disturbances. In addition, the team conducted on-site inspection of damage to medical facilities in Al Najaf, Kerbala, and Kirkuk.

The direct damage to the complex network of water, sewage, and electrical supply has effected public health much more substantially than the lingering structural damage to specific buildings. Although some structural damage is still evident, nearly all the hospitals and health centers inspected by the Facility Team have substantially reconstructed their physical walls.

Water supply to most hospitals and health centers in Iraq is intermittent and of very poor quality. For example, the Facility Team visited two centers in Basrah governorate with no water supply whatsoever.

In a bacteriological survey carried out by the Facility Team, 30 percent of hospital water sources visited in southern Iraq were grossly polluted with coliform-indicative of fecal contamination.

Water quality remains poor and contaminated due to a lack of chlorine. Ramadi Maternity and Children's Hospital was using tanked-in river water which they attempted to purify with chlorine. Because of chlorine shortages, however, the hospital resorted to adding 50% of the recommended levels. Erbil Maternity and Pediatric Hospital uses well-water that was then treated with UNICEF-supplied chlorine.

In the Kurdish areas, the Facility Team found a large number of Oxfam tanks and International Committee of the Red Cross (ICRC) tankers providing water to returnees. Nevertheless, returnees often bypassed these sources for more accessible, yet contaminated, streams. Rania General Hospital uses ICRC-supplied water for patients and medical procedures. The study team tested the water pipes that provide water for

hospital sanitation. It was found to be heavily polluted with coliform.

4.7 Sanitation The Facility Team found sanitation to be poor in nearly all of the hospitals. Laboratories were clogged and unkept. Detergent and soap was a rarity.

For example, Ramadi Maternity and Pediatric Hospital had no means, save polluted water, to clean the wards. At Ibn Al Athir Hospital in Mosul, the hospital sewage system had deteriorated to such an extent that it had backed up into the wards. Both Ramadi and Mosul hospitals were unable to provide sheets for patients because of the lack of detergent.

4.8 Electricity The status of electricity in Iraq is extensively documented elsewhere in this report.⁴ Nearly all the hospitals administrators with whom the Facility Team spoke, complained of unstable voltage and intermittent power failures, on average, for two or three hours daily. While the direct effects on patient care and comfort are obvious, fluctuations in electricity additionally damage sensitive medical instruments as well as heat sensitive drugs and vaccines. In Rania, the hospital relies on a generator supplied by ICRC.

4.9 Accessibility and Utilization of Health Services Although not necessarily indicative of utilization patterns, hospital occupancy rates were generally found to be 50-80 percent throughout Iraq. The Facility Team attributes this low occupancy rate to the following three factors:

- 1) Ward closing due to insufficient supplies and inadequate staffing levels;
- 2) A decrease, in some localities in the north, in the incidence of diseases requiring hospitalization; and
- 3) An increase in the proportion of patients receiving outpatient treatment. This is especially true in the southern hospital facilities that are experiencing shortages of in-patient food, medicines and water. Throughout the country the inability to maintain even minimal standards of hospital hygiene has increased the risk of cross-infection forcing many physicians to send patients home instead of treating them in aseptic hospital environment.

5 OBSERVATIONS AND COMMENTS

Anecdotal information collected by the Facilities Team suggests that the population has generally lost faith in health care system that can rarely meet even their most basic health needs. Long waiting lines leading to physicians with little to offer in the way of substantive care has discouraged many individuals from utilizing available services. Furthermore, it was found that many Iraqi mothers are no longer bringing their infant children for vaccinations because the common belief is that such services are extremely limited, if not altogether unavailable.

The improvement in Iraq's transportation system over the past several months has helped increase civilian access to the health system. The exception to this is that many families, relying on mobile outreach services, are still not receiving medical assistance. Nevertheless, critical preventive services, such as vaccinations, continue to lag due to a breakdown in the supply of vaccines as well as in the delivery system.

Although the Iraqi health care system tends to emphasize curative medicine, there were a number of public health initiatives that were affected by the disruption of health services, including:

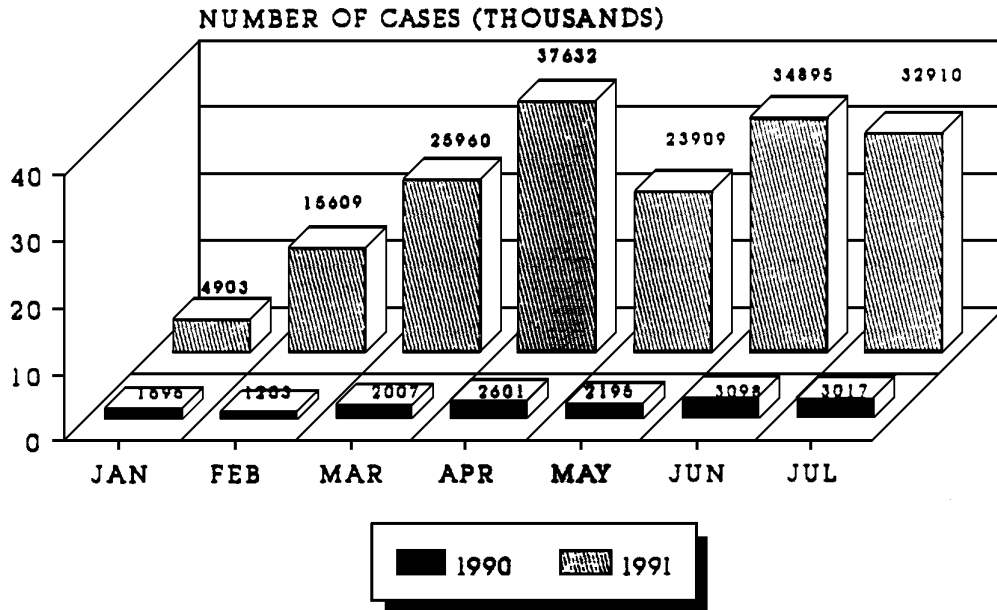
- vaccination services
- control of diarrheal diseases
- environmental health (water testing, food hygiene)
- outreach services, rural health care
- health education, social mobilization
- ante-natal care, maternal child care

The disruption of the supply, administrative and transport capacity of the Ministry of Health means that restorative of these activities will lag behind other rehabilitative efforts.

APPENDICES

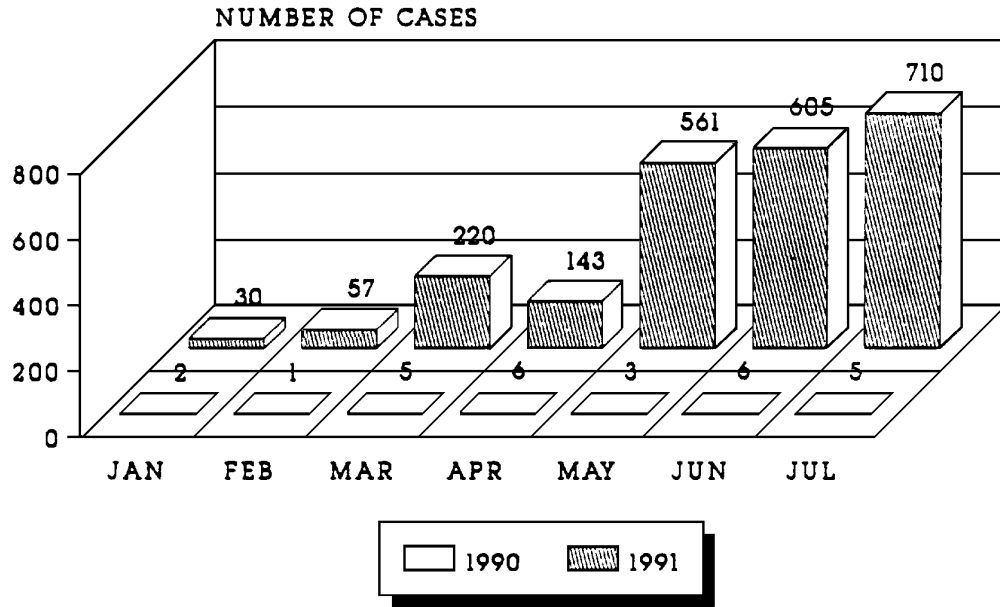
**REPORTED INCIDENCE OF DIARRHEA
IN CHILDREN UNDER FIVE YEARS OF AGE**

BASRA GOVERNORATE (1990/91)



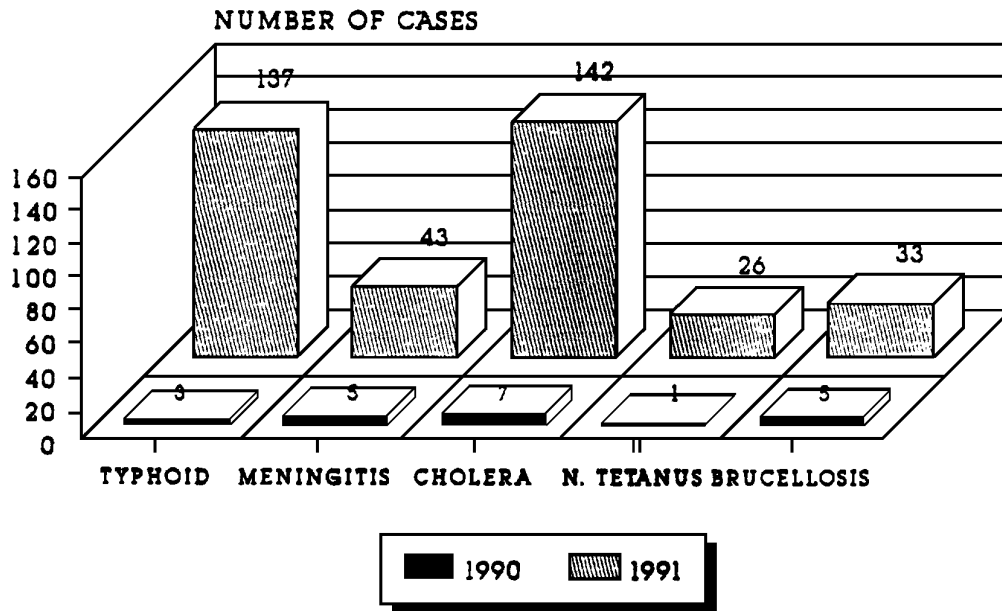
SOURCE: MINISTRY OF HEALTH, BASRA

**REPORTED INCIDENCE OF TYPHOID
IN CHILDREN UNDER FIVE YEARS OF AGE
BASRA GOVERNORATE (1990/91)**



SOURCE: MINISTRY OF HEALTH, BASRA

**REPORTED INCIDENCE OF INFECTIOUS DISEASE
IN CHILDREN UNDER FIVE YEARS OF AGE
BABEL GOVERNORATE (MAY-AUG 1990-1991)**



SOURCE: MINISTRY OF HEALTH, BABEL

ENDNOTES:

¹ Because the hospital was closed during the March 1991 uprisings, the aggregate number of admissions are lower in 1991 than 1990.

² A simple salt and sugar water mixture designed to prevent death from diarrhoeal dehydration.

³ UNICEF, Iraq Immunization, Diarrhoeal Disease, Maternal and Childhood Mortality Survey, 1990.

⁴ See Electrical Systems' Survey, October, 1991.

ELECTRICAL FACILITIES SURVEY

by
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Warren Piper
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October 1991

**ELECTRICAL FACILITIES
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ELECTRICAL FACILITIES IN IRAQ

Synopsis. Between 25 August and 4 September, the Study Team conducted a survey of the electrical power system in Iraq to assess the current status of the system and the degree to which it has been affected by the Gulf Crisis. The survey consisted of unannounced and unescorted inspections of electrical facilities in all regions of Iraq (see **Table 2**). During site visits, team members interviewed responsible personnel and inspected and photographed all major elements of the site.

The major findings are: (1) electrical generation has been restored to about 68% of 1990 peak load and about 37% of installed capacity, and about 75% of transmission lines are operable; (2) the capability for repair has been exhausted and the system can be expected to deteriorate due to failing equipment; (3) lack of spare parts is the primary factor limiting capacity to repair and rebuild; and (4) damage to the electrical system has had a profoundly negative impact on public health, water and wastewater systems, agricultural production, and industrial capacity.

Team members inspected five switching stations and 16 major power stations representing 8,805 MW, about 93% of pre-war installed capacity of about 9,500 MW (see **Table 1**). Allied bombing had reduced generation at these stations to less than 300 MW immediately after the war (see **Graph 1**). At least ten of 16 power stations visited were attacked on the first day of the war, and at least 14 were attacked multiple times (see **Table 3**). Extensive repair has been undertaken, using parts salvaged from damaged facilities because new parts cannot be imported from foreign producers. These stations now have a maximum net capability of 3665 MW. The entire system has an estimated generation capability of 3500 MW. This figure represents about 68% of 1990 peak load of 5162 MW. The transmission was also badly damaged during the war, but about 75% of these lines have been put into operation.

The damage to electrical generation and distribution has profoundly impacted the entire health infrastructure, which is entirely dependent on the national grid for power supply. Shortage of power has been a limiting factor in the operations critical health-related facilities. Due to absent or erratic power supply, hospitals and health centers have had limited capacity to sterilize equipment and refrigerate vaccines and medicines (see **Health Facility Survey**), water stations have had limited capacity to purify and distribute water, and wastewater stations to treat and dispose of raw sewage (see **Water and Wastewater Survey**). As a result, Iraq has seen increases in mortality and morbidity due to increased levels of water-borne and waste-borne disease (see **Child Mortality and Nutrition Survey, and Environmental and Agricultural Survey**). In addition, agricultural production, especially in cultivated lands south of Baghdad, is heavily dependent on irrigation. Lack of electricity prevented water pumping during the recent planting season, resulting in decreased harvest yield (see **Environmental and Agricultural Survey**).

Lack of replacement parts is the primary factor preventing repair and rebuild of the electric power system to restore pre-war system capability and ensure reliable delivery to the health infrastructure. The extent of repair already accomplished employed salvaged parts and improvised methods. However, much repair, especially in the switchyards and first-span connections to transmission, does not meet normal standards of construction, poses increased safety risks, and is likely to break down. Overworked equipment and hastily improvised repair has already led to a high rate of break down. The store of salvageable parts is depleted; Iraq does not have the capability to manufacture the necessary items.

1 OVERVIEW The report has four sections: overview, methods, and findings. (**Appendix A**) provides summary reports of site inspections and interviews. (**Table 1**) provides a list of sites inspected pre-war and current capacity. (**Table 2**) provides dates, team members, and persons interviewed during each site inspection. (**Table 3**) provides a brief bomb damage assessment of each site.

1.1 Electric Power Generation and Transmission Electric generation in Iraq is provided by a mix of thermal, hydro-electric, and gas turbine stations. Nineteen main stations with MW capability exceeding 80 MW provide over 99% of total power. Six thermal stations provide 5140 MW, five hydro-electric provide 2270 MW, and eight gas turbine provide 2011 MW. The hydro stations are located in northern Iraq, while

the gas turbine and thermal stations are dispersed in the northern, central, and southern regions. One unusual feature of Iraq's power system is an high reserve capability--almost 46% of installed capability.

A 132 kV transmission system is well-engineered to interconnect generating stations and provide service to major load centers, for example cities and very large refineries. Overlaying this system is a 400 kV transmission system which has been designated "the 400 kV Supergrid." The 400 kV Supergrid loops from Saddam hydro station in the north to Hartha thermal station in the south, and provides for moving large blocks of power between the northern, central, and southern regions of the country. Four major 400 kV switching stations interconnect the supergrid to the 132 kV transmission system.

The 66 kV and 33 kV sub-transmission systems feed from the 132 kV system and feed into major users and distribution centers in cities throughout Iraq. Most of the intra-city distribution is at 11 kV via overhead circuits feeding commercial users and pole-mounted transformers in neighborhoods, which step down the voltage to 110 V for residential users.

1.2 Objectives The specific objectives were: (1) to document physical and operating conditions of generating stations and key switching stations, (2) to determine changes that have occurred due to the Gulf Crisis, and (3) to assess the consequences of the changes.

1.3 Significance Iraq depends on its power system for a wide range of essential private consumer, health-related, and industrial systems. Electricity must be sufficient in capacity to provide a reliable power source to these essential systems.

2 METHODS The study was a field investigation to document by interviews and first hand observations the conditions of electrical utilities in Iraq with respect to their physical damage and their operating capabilities.

2.1 Scope The project surveyed the conditions of most major electrical facilities in Iraq. The sites were selected by team members to gain a comprehensive picture of conditions throughout the country. The study was comprised of site inspections and interviews at 23 facilities over a ten day period from 26 August to 4 September, 1991. In total, the study team spent twelve days in Iraq between 24 August and 4 September.

2.2 Site Visits Site visits were authorized by letters prepared by the Ministry of Foreign Affairs for the regional governorates and by the General Establishment for Electricity. In accordance with the rules set up by the Study Team, government officials did not accompany the teams on the itinerary. Sites were independently selected to achieve a geographic and operational sample. Interviews were conducted coincident with the site visits to provide orientation concerning the local operation and to review the specific problems. The statements obtained during the interviews were documented by first-hand observations.

2.3 Personnel The electrical team divided into two groups, a north team of Warren Piper and Walid Doleh, and a south team of Abdel Qamhieh and Kamel al Tallaq. Mr. Piper is a retired Senior Vice-President from Stone & Webster Engineering Corp. Mr. Doleh is a chemical engineer with Jordan Electric Authority. Mr. Qamhieh is chief of Plant Maintenance for Jordan Electric Authority. Mr al Tallaq is a chemical engineer with Jordan Electric Authority.

3 FINDINGS The findings highlight the recurring themes encountered in site visits as reported in **Appendix A.**

3.1 Generating Stations Team members inspected 14 generating stations with capability exceeding 200 MW, and 16 of 19 with capacity exceeding 80 MW, representing 8805 MW out of Iraq's estimated pre-war installed capacity at 9500 MW. Maximum current output from these stations is 3665 MW. However, generation capability is somewhat less, because units cannot run 24 hours per day at 100%. The estimated generation capability is 3500 MW, about 37% of pre-war capacity.

Generating stations were intensively targeted during the early days of the air war. The southernmost stations were especially hard-hit; Basrah's two stations only generate 45 MW out of a pre-war capability of 1000 MW. At least ten of 16 stations visited were bombed on 17 January, the first day of the war. Several were hit first with metallic threads, which short-circuited the network and prevented transmission, including Beiji and Musayeb, the largest generating stations in Iraq. At least fourteen were hit multiple times, many after they had shut down. A1 Hartha in Basrah was hit 13 times, from the morning of 17 January to 15 minutes before the cease-fire.

Repairs were hastily done under difficult conditions, and cannot long survive the demands under which they are currently placed. Moreover, most repairs were effected by salvaging parts from the most damaged equipment to rehabilitate the least damaged. The store of damaged parts has been exhausted, so further repair of this kind is not possible. In addition, those machines from which parts were salvaged must now await a total rebuild. Therefore, Iraq will not be able to maintain capacity at its current level.

3.2 Switching Stations and Transmission Team members visited two major switching stations on the 400 kV supergrid line and three on the 132 line. There are four major 400 kV switching stations which interconnect the 400 kV and 132 kV systems, and numerous 132 kV switching stations which step down voltage from 132 kV to 66 kV, 33 kV or 11 kV.

The transmission system consists of about 3700 km of 400 kV line and 13300 km of 132 kV line. About 75% of the transmission network has been repaired to the point of being operational, but much of the work is substandard, and stability problems may exist. The damage to switching stations and transmission lines makes it impossible to utilize all available generation, it is not always possible to match load requirements with generation capacity.

There is a critical need for circuit breakers, overhead line conductors, relaying, conductors, insulators, fittings, transformer oil, and distribution material. Until these parts can be imported from foreign producers, the transmission network will deteriorate and the system's capacity to use what electricity can be generated will diminish. The deterioration of the electric power system will limit essential services and facilities such as health infrastructure, industrial production, and agricultural production.

4 AUTHORS

Walid Doleh Walid Doleh graduated from the faculty of Electrical Engineering from the University of Zagreb, Yugoslavia in February 1972. He is employed by Jordan Electric Authority since May of 1977. He is the second head of substations Design and Construction.

Warren Piper. Warren Piper retired in 1985 from Stone & Webster Engineering Corp. as a Senior Vice-President. During 38 years with the Stone & Webster, he held the positions of Chief Electrical Engineer and Director of Construction, in which capacity he oversaw the engineering, design, and construction of numerous power stations and transmission systems. Before retirement, he was a Registered Professional Engineer in five states. Mr. Piper is a senior member of the Institute of Electrical and Electronic Engineers.

Abdel Qamhieh Abdel Qamhieh is a graduated engineer from Azher University in Egypt (1969). He is employed by Jordan Electric Authority as Head of Electrical Maintenance section and Manager Deputy of Hussein power station.

Kamel al Tallaq

APPENDIX A REPORTS OF SITES VISITED

This appendix contains summaries of all site visits to electrical facilities. Information on pre-war conditions was collected during on-site interviews and verified during inspection. Information for damage reports was collected from corroborated on-site interviews. Information for current conditions was gathered during site inspections.

A.1 North Region

A.1.1 Dibbis Thermal and Gas Power Station Dibbis is located about 30 km west of Kirkuk. On 26 August Mr. Piper and Mr. Doleh inspected and photographed the station and interviewed Jennie Jabbour, chemical engineer, Mohammed Salem, network maintenance engineer, and the station supervisor.

Pre-War Condition. Dibbis Station had a pre-war generating capacity of 194 MW continuous. Name plate rating of the six gas turbine generators was 35 MW each and the four steam turbine generators was 15 MW each. One gas generator ceased operation during the war with Iran. The gas generators were built by Fiat (Italy) in 1982–85, using Westinghouse (USA) machinery. The steam turbine generators were built by Motoren Werke Mannheim (Germany) in 1958–59. Dibbis was the sole power supply for Kirkuk's main water treatment plant.

Damage Report. Dibbis Station was attacked five times during the war. Team members counted 21 bomb craters in the station, including 13 in the vicinity of the gas generating units. The first attack, on 24 January at around midnight, damaged all six gas generators and destroyed fuel tanks and fire engines. After this attack, the station ceased generating electricity. The second attack, on 27 January, damaged the steam turbine generators and destroyed one water storage tank. The third attack, in late January, further damaged three gas generators. The fourth attack, in early February, damaged the tower and fence area and destroyed a spare parts warehouse. The fifth and heaviest attack, on 10 February, further damaged the gas and steam turbine generators, destroyed two crude oil tank, one petrol tank, and one water tank, and damaged the switchyard, circuit breakers, transformers, administration building, control room, hospital, office building, and bomb shelter.

Current Condition. Two gas turbine generators are capable of operating and a third should soon be available. These were repaired by cannibalizing parts from the other gas turbine generators. The turbine room plant of the four unit thermal plant will require a near total rebuild. The remaining generation on site will not be restored until necessary parts from Germany, Italy, and Hungary are available. The switchyard, circuit breakers, and transformers remain severely damaged; much of it is beyond repair. Temporary connections to allow generation from the two operating gas turbines are unstable and risk causing further damage as a result of an exogenous event.

A.1.2 Mulla Abdullah Gas Turbine Power Station Mulla Abdullah is located about 45 km southwest of Kirkuk. On 3 September, Mr. Normand and Mr. Dallal inspected and photographed the station and interviewed Hader al-Jumaily, electrical engineer and general manager, and Sirwan Said, mechanical engineer.

Pre-War Condition. The station, built in 1980 with John Brown (Scotland) as major contractor, had a pre-war capacity of 240 MW from 12 gas turbine generators of 20 MW each.

Damage Report. The station was attacked three times during the war. More than 20 bomb craters, ranging from three meters diameter by 1.5 meters depth to eight meters diameter by 3.5 meters depth are scattered throughout the station. In the first attack, on the morning of 25 January, a cluster bomb hit near the station's fence. Hundreds of cluster bombs scattered and damaged the fence, a crude oil storage tank, and fuel distribution pipes. The station continued to operate after the attack, but at reduced capacity. The second attack, on the night of 7 February, concentrated on a small military barracks on the outskirts of the station which housed about 20 soldiers, and also destroyed a 30 ton crane. The third and heaviest attack, at

00:15 on 18 February, damaged one 33–11 kV transformer and three 11/11/132 step up transformers, spilling about 60,000 liters of lubricating oil. The bombs also damaged three gas heaters, two gas separators, the switchyard, circuit breakers, towers, and 33 kV and 11 kV transmission lines, including Kirkuk North Oil Company, Dibbis water treatment plant, Al-Abbasiy agricultural district, and irrigated farmland south of Kirkuk. After this attack, the station ceased generating electricity.

Current Condition. After extensive repair, using some parts from storage and some cannibalized from other damaged stations, Mulla Abdullah now produces 220 MW from 11 generators. Clean-up and repair crews began working 19 February. The units returned on line on 3 March, 5 March, 13 March, 14 March, 15 March, 18 March, 3 April (two units), 10 April, 13 April, and 21 August (two units).

A.1.3 Taza Supergrid Switching Station. Taza is located between Kirkuk and Tikrit. On 26 August, Mr. Piper and Mr. Doleh inspected the station and interviewed Mr. Hahjub and Yousef, operations engineer.

Pre-War Condition. The Taza switching station, built by Mitsubishi (Japan) in 1985, has four transformers, each 250 MVA, tie the 400 kV system to the 132 kV transmission system. The station feeds seven 132 kV substations in northeast Iraq. Supply from the 132 kV system is stepped down to lower voltages and distributed to the key facilities in the north region's economic infrastructure. Users include oil refineries, factories, water pumping stations, as well as millions of private consumers.

Damage Report. Taza was attacked once, on 17 January at 12:45. Three bombs exploded in the air, sending shrapnel throughout the station and into workers' homes as far as 200 meters away. Two transformers were destroyed, one was severely damaged. Also severely damaged were circuit breakers, transmission lines, bus work, structures, and other components in the switchyard. The switching station was out of service for two days after the attack.

Current Condition. Extensive repairs were undertaken, and service has been partially restored. However, without importing replacement parts and components, the station cannot be further repaired.

A.1.4 Mosul-Mansur Gas Turbine Power Station Mosul-Mansur is located in the city of Mosul. On 27 August, Mr. Piper and Mr. Doleh inspected the station, and interviewed Amer Izilden, chief engineer.

Pre-War Condition. Generation at this station was provided by twelve 20 MW gas turbine generators feeding into the 132 kV grid. Feeding from the station were four 132 kV lines, four 33 kV lines and six 11 kV lines. There were eight 11/132 kV step up transformers. The 33 kV and 11 kV circuits feed Mosul City including a small hospital and city water plant. Distribution circuits are installed both overhead and underground.

Damage Report The 132 kV switchyard and 11 kV step-up transformers were essentially destroyed. A separate relay house for line and transformer protection was completely destroyed. One gas turbine was destroyed beyond repair. The other eleven gas turbines were damaged from shrapnel and fire. Supporting structures for the gas turbines were severely damaged. At least one fuel oil tank appears beyond repair.

Current Condition. The station generates up to 102 MW. Six of the gas turbine generators have been restored to operation, although repair is incomplete and maximum capacity for each unit is about 17 MW. One unit is completely destroyed, although the remaining five, while badly damaged, might be salvageable. The major impediment to restoring these generators as well as the especially hard-hit switchyard is spare parts and components, including transformers and overhead conductors.

A.1.5 Mosul-Yarmouk Gas Turbine Power Station. The station is located in the city of Mosul. On 29 August, Ms. David inspected and photographed the station, and interviewed Yaraleh Yasem, engineer and general manager, and Mr. Izilden, chief engineer.

Pre-War Condition. Mosul-Yarmouk has seven gas turbine units with a combined peak generating capacity of 500 MW. The station was built in two stages. Three units were constructed in 1972 and four in

1976 by Hitachi (Japan), ACEC (Belgium), and AEG Aliston (France). The station's 132 kV lines feed refineries, factories, and civilians, including two textile factories and one water pumping station. Military use was reportedly limited to one 11 kV line fed through the supergrid.

Damage Report. According to records, the station was attacked six times. The first attack, according to civil defense records, was at 8:00 on 17 January by five cruise missiles. Circuit breakers and two transformers were destroyed, and the substation which transforms the voltage to 132 kV was damaged. After this attack, the station ceased all operations; it could no longer connect to the service areas and supergrid through the substation. The second attack, at 11:00 on 21 January, destroyed three gas units, two transformers, and civilian houses in nearby Wadi Ain. In the third attack, at 01:00 on 22 January, stores of consumable spare parts and towers and substructures were destroyed. In the fourth attack at 23:00 on 24 January, gas generators and other previously hit facilities were further damaged, more houses in Wadi Ain and a nearby gas station were damaged. The fifth attack, at 00:00 on 5 February, caused further damage to the substation building. The sixth and heaviest attack, on 12 February at 1:00, damaged one crude oil storage tank, destroyed two others, spilling one million liters of crude, further damaged all seven generating units, and destroyed about 70% of the buildings in the station, including a workshop, a warehouse, and 13 workers' homes. After this attack repair capability severely curtailed.

Current Condition. The station generates about 30% of pre-war capacity, with a peak capability of 200 MW. Further repairs cannot be made until spare parts can be imported from Japan, Belgium, and France.

A.1.6 Mosul Supergrid Switching Station. The substation is located in the city of Mosul. On 27 August, Mr. Piper and Mr. Doleh inspected the substation, and interviewed Mr. Izilden and Manaf Yassin, reconstruction engineer.

Pre-War Condition. The Mosul substation links the 400 kV and 132 kV transmission networks with four 250 MVA transformers. The substation had five 400 kV lines.

Damage Report. The substation was damaged severely during the war and has remained totally off line. The outdoor equipment for three of five 400 kV lines has been totally destroyed. The indoor 400 kV bus work and circuit breakers were heavily damaged. Three transformers were destroyed and one was badly damaged. All the 132 kV switchgear and controls and half the 11 kV equipment were destroyed. Steel transmission towers adjacent to the site were damaged.

Current Condition. Clean-up and repair work is currently underway, but many structures will have to be rebuilt. One of the transformers and the indoor 400 KV bus work and circuit breakers may be partially restorable, but spare parts and skilled technicians from the original equipment manufacturers are needed before this work can be done. For now, the station must be bypassed by means of jumpers at the line towers.

A.1.7 Mosul Distribution Directorate. The Directorate is located in the city of Mosul. On 28 August, Mr. Piper and Mr. Doleh visited the MDD and interviewed Zeid Wafiq, chemical engineer and technical manager, and Habib Kiriakus, control center engineer.

Pre-War Condition. According to engineers responsible for electrical distribution in Mosul, pre-war peak load was 320 MW.

Current Condition. Current peak load is limited to 120–220 MW, depending on availability of power from the system, since Mosul still cannot accept generation over the 400 kV lines because of limitations in their switchyard. Load shedding by means of manual switching at the substations occurs daily. Blackouts are also a common occurrence.

A.1.8 Erbil Distribution Directorate. Mr. Normand and Mr. Dallal interviewed Shwan Rashid al-Mufti, Director of Electrical Distribution in Erbil Governorate, and Mohammed Sulaimen, Director of Planning.

Damage Report. Mr. al-Mufti stated that few electrical facilities in the Erbil Governorate were

attacked. He listed several km of transmission lines, four medium tension pole-mounted transformers for neighbourhood use that were damaged in attacks. These transformers were situated near telecommunications towers and military compounds, so it appears that they were not the specific object of attack. None of the three 132 kV substations or the 21 33 kV substations were attacked. The Governorate lost all power from 17 January until April 16, when Dibbis began supplying again. Since August 28, Erbil city has received power almost 24 hours per day, but the power supply is spotty and fails frequently.

A.1.9 Saddam Dam Hydro Power Station. The station is located on the Tigris River between Mosul and the Turkish border. On 28 August, Mr. Piper and Mr. Doleh inspected the station, and interviewed Mohammed Ismail, engineer and general manager, and Abdel Haq Taha, operations engineer.

Pre-War Condition. This project comprises three stations and had a peak capacity of 1050 MW. The main power station has four units, each rated 187.5 MW. A regulating hydro station has four units, each rated 15 MW. A pumped storage station has two units, each rated 120 MW. The main station has two 400 kV lines to Mosul and two 400 kV ties to the pumped storage. There were a number of 132 kV lines transmitting power from the regulating dam project.

Damage Report. The entire complex was extensively damaged by bombs. Generating units, turbines, surge tanks, switchyard, circuit breakers, transmission lines, warehouses, and service buildings all incurred damage.

Current Condition. Two of the main station's hydro units have been returned to service. The other two units cannot be placed in service unless new transformers are installed.

A.1.10 Beiji Thermal Power Station. Beiji is located between Tikrit and Kirkuk. On 29 August, Mr. Piper and Mr. Doleh inspected the plant, and interviewed Mr. Ghazi, Abdel Jadaan, chief of planning, and Kathem, an engineer.

Pre-War Condition. Beiji is the largest electric generating station in Iraq. The plant has a total generating capacity of 1320 MW represented by six 220 MW steam units. There are six 400 kV lines: two south to Baghdad, two north to Mosul, one northeast to Kirkuk, and one southwest to Haditha. There are eight 132 kV lines out of Beiji. The station was built in 1983–84 by GIE (Italy).

Damage Report. Beiji was attacked twice during the war. At 17:30 on 17 January, planes dropped metallic threads on the switchyard and high voltage lines, short-circuiting them. Team members collected samples of these threads. After this attack, the station stopped all generation. At mid-day on 18 January, as workers were removing the thread from the station, three bombs hit the station. Two bombs penetrated the concrete wall of the turbine room and severely damaged three generating units, damaged two others, and impaired another. The third bomb hit near and destroyed the relay house located in the outdoor switchyard and the 400/132 kV substation, destroying one transformer and damaging one.

Current Condition. All steam turbine generators are now capable of operating, although one is undergoing some repair for damage unrelated to the war. The units became operational on 31 March, 5 April, 10 April, 13 April, and mid June (two units). However, peak capacity for the station is limited to 820 MW. A new structure for the relay room is now being constructed and some line relay panels have been salvaged. Only three of the six 400 kV lines are energized, two to Baghdad West and one bypassing Mosul to Saddam Dam. The switchyard is in good condition, having suffered little damage, although the lack of protection for bus fault poses a risk.

A.2 Central Region

A.2.1 Samarra Hydro Power Station. The station is located on the outskirts of the city of Samarra. On 30 August, Mr. Piper and Mr. Doleh inspected the station, and interviewed Khaled Saleh, engineer and general manager.

Pre-War Condition. The station, built in 1961 by an Italian company, can generate 84 MW from three

28 MW hydro units. The station transmits power via six 132 kV lines and is an important tie for the 132 kV network.

Damage Report. The station was not generating electricity when the war started. On 21 January, Unit 1 resumed production at 20 MW. On 27 January, Unit 3 also resumed at 20 MW. On 7 February at 14:30, the station was attacked and extensively damaged. One bomb hit directly in the generating units, severely damaging Units 2 and 3 and damaging Unit 1. One bomb hit and destroyed a 250 ton gantry crane. One hit and destroyed the garage near the switchyard. Two fell in the switchyard, damaging circuit breakers and five 132 kV lines. One hit and damaged a concrete wall along the Tigris. Several fell in the workers' compound 100 meters southwest and destroyed or damaged about ten homes.

Current Condition. Unit 1 was restored to service July 25 and is now base loaded at 26.5 MW. Parts from Unit 3, notably the governor, were used to place Unit 1 back in service. All six 132 kV lines are in service after salvaging parts from generator circuits of Units 2 and 3. The intake gate for Unit 3 is still badly damaged, and neither Units 2 nor 3 will be put on line until foreign parts and components can be imported.

A.2.2 Taji Gas Turbine Power Station. Taji is located on the northern outskirts of Baghdad. On 31 August, Mr. Piper and Mr. Doleh inspected and photographed the station and interviewed Aiser Habib, engineer and general manager.

Pre-War Condition. Taji, built in 1964 by American and British companies, has peak capacity of 154 MW through seven gas turbine units rated at 22 MW each, although normal use is at 20 MW. The station employs five 132 kV step up transformers with 132 kV lines connected to the 132 kV system.

Damage Report. The station was attacked three times. On 17 January, at 14:30, metallic threads were dropped on the transmission network, shorting the power lines and preventing the transmission of electricity. In the second attack at 17:30 on 18 January, bombs and cluster bombs fell throughout the station, destroying four fuel tanks, setting fire to the fuel distribution system, causing severe damage to five gas turbines and all five 132 kV step up transformers and the 132 kV lines and minor damage to the remaining two gas turbines, destroying two control and buildings, and damaging the administration building. At 18:00 eight firefighters arrived to extinguish the blaze. At 19:00 the station was hit again by one cluster bomb, which killed two firefighters and badly injured four others, and further damaged the gas turbines.

Current Condition. The two gas turbines which suffered minor damage have been restored to service at 20 MW each. The remaining five cannot be re-commissioned in the near future because of a lack of replacement parts. Two of five 132 kV lines are back in service through use of mobile substations. Line protection equipment remains unavailable for the other three lines.

A.2.3 Dhaura Thermal and Gas Turbine Power Station. Dhaura is located in south Baghdad. On 31 August, Mr. Piper and Mr. Doleh inspected the station, and interviewed Fayik Mustafa, engineer and manager of reconstruction.

Pre-War Condition. Dhaura had a generating capacity of 740 MW from four 160 MW steam turbine units and four 25 MW gas turbine units. Ten 132 kV lines feed power from the station.

Damage Report. On 17 January, metallic threads shorted and disabled the switchyard and transmission lines. On 18 January the station was bombed, and the four unit steam turbine plant was disabled and one turbine crane and one chimney destroyed. The turbine room and control rooms were also severely damaged and affected steam turbine parts. In addition, two feed water tanks and a considerable amount of boiler plant piping were damaged from shrapnel.

Current Condition. One steam turbine unit was returned to service on May 14, another on June 15, producing 280 MW between them. A third may be recommissioned soon, and the fourth needs a rebuild of the chimney. There was no damage to the gas turbine plant.

A.2.4 Al Qadissiya Hydro Power Station. Al Qadissiya is located northeast of the city of Haditha. On 29 August, Ms. Van Heck and Mr. Saad Hamid inspected and photographed the station, and interviewed Hassan, chief engineer, and the manager of reconstruction.

Pre-War Condition. Al Qadissiya has a generating capacity of 660 MW from six 110 MW hydro units. The station feeds power through 400 kV lines to Baghdad, Beiji, Al Qaim, and a future site, and six 132 kV lines.

Damage Report. The station was attacked four times. At 22:00 on 18 January, bombing destroyed the spare parts warehouses, all gantry cranes, the information building, and the control room. At 21:00 on 24 January, the hydro generators, the covers of the dam's transformers were damaged, and the administration building was slightly damaged. The third and fourth attacks took place within one hour of the cease-fire on 28 February, causing further damage to the station and also damaging the Al Qadissiya water treatment plant situated near the station's south entrance gate, which was hit by cluster bombs.

Current Condition. Much of the station remains in damaged condition. The limited repairs to date have relied on cannibalization of parts from damaged components from within the station. Generation is at 110 MW, 60 MW from one unit and 50 MW from another. Only two 400 kV and two 132 kV lines are in operation. A.3 South Region.

A.3.1 Khor Al Zubayr Gas Turbine Power Station. The station is located north of al-Zubayr city. On 27 August, Mr. Qamhieh and Mr. al-Tallaq inspected and photographed the station, and interviewed Hahism Mouly, engineer and general manager, and Sabah Atteya, mechanical engineer.

Pre-War Condition. This 252 MW gas turbine plant had four 63 MW units.

Damage Report. The station was attacked twice, causing widespread damage to the gas turbines and overhead lines. All four units were damaged, including gas oil tanks, pipeline, fuel pumps, heat exchangers, hydraulic control system, gas combustion chamber, transformers and generators.

Current Condition. Total capability is now 125 MW. Units 1 and 4 are now operating at 45 MW each, and Unit 10 2 at 35 MW, while Unit No. 3 is inoperable having been used to provide salvaged parts.

A.3.2 Najibia Thermal Power Station. Najibia is located on the outskirts of Basrah. On 27 August, Mr. Qamhieh and Mr. Al-Tallaq inspected and photographed the station, and interviewed Noor Al-Deen Tawfeq, engineer and general manager of Basrah Power Generation, and Reyad Hussein, network manager of South Electric.

Pre-War Condition. Najibia was built by a Soviet company in 1975-76 and has a capacity of 200 MW from two 100 MW steam units. The two units, each 100 MW, were originally intended to be base loaded. The plant had not been in operation for some time at the commencement of the Gulf War.

Damage Report. Najibia itself was only indirectly hit during the war. On 17 January, the main water line to the plant suffered collateral damage. In early February, the water line had been repaired to 50% capacity.

Current Condition. The inability to obtain the parts to rehabilitate the plant has been the major impediment to maintaining the units on line as well as the inability to obtain rated output. Unit 1 is limited to 45 MW essentially on manual control. Unit 2 has shaft and bearing problems and cannot be operated.

A.3.3 Al Hartha Thermal Power Station. Hartha is located in Basrah. On 28 August, Mr. Qamhieh and Mr. al-Tallaq inspected and photographed the station, and interviewed Mr. Jassim and Abdel Amer Aboud, assistant manager.

Pre-War Condition. Hartha, built in the early 1980s by Japanese companies, is the largest generator in

southern Iraq, with a 800 MW capacity from four 200 MW steam units. The station was a crucial supplier to the 400 kV and 132 kV systems.

Damage Report. Hartha was attacked thirteen times during the war, more than any other power plant, and sustained very heavy damage. At 21:00 on 17 January, workers evacuated to three bomb shelters in response to air raid sirens. At 23:00, the station was bombed continuously for over 20 minutes. Army officers who visited the site the next day told station personnel that the station was hit by 6-7 Tomahawks and 15-20 conventional bombs. The bombs damaged all four steam boilers, the water treatment plant, water cooling and distribution pumps, the power house, and the administration building. The fuel station was hit, caught fire, and burned for five days. Two bombs hit one of the shelters, killing seven employees. After this attack, the plant ceased all operation. On 7 February, the station was attacked again, and damage caused to the generating units and destroying three fuel tanks and one water tank. The station was subsequently attacked 11 more times, the last occurring 28 February, the day of the cease-fire.

Current Condition. There is no generation available from this four 200 MW unit station as it was nearly completely destroyed. It is doubtful that these units can be placed back in service except by total reconstruction. The following are examples of damage that remains over seven months after the war's end: Unit 1 steam generator support structure is depressed approximately one meter on one side; fuel facilities, control systems, power transformers, and cooling water intake system are all severely damaged and in some cases burned; the other three units have damage similar to Unit 1 although Unit 1's boiler structure appears to be in the worst condition; unit 4's turbine casing was penetrated, damaging low pressure blades and diaphragm. Other items destroyed include the water intake, hydrogen plant, turbine room cranes, administration building, and many other structures and facilities.

A.3.4 Al Nasiriyah Thermal Power Station. The station is located in the city of Nasariyah. On 29 August, Mr. Qamhieh and Mr. Al-Tallaq inspected and photographed the station, and interviewed Husam Haleem, senior operations engineer, Adela Mahde, civil engineer, and Suhel Najem, electrical engineer. On 1 September, Mr. Mutawi inspected the station and interviewed Mr. Haleem.

Pre-War Condition. Nasiriyah, built in the 1980s by Teknobrom Export (Soviet Union) has 840 MW capability through four 210 MW steam turbine units.

Damage Report. Nasiriyah was damaged in three attacks. The station went into voluntary shutdown 19 January because several key receiving substations had been damaged and were cut off from the station, and the manager thought that the station would be hit. At 17:30 on 25 January, the station was bombed and the fuel gas receiving stations were damaged. At 15:30 on 5 February, another attack caused light damage throughout the station. Auxiliary cables and four towers were destroyed, as were water, steam, fuel, and chemical pipes. Steam boilers one and four were partially damaged, and the water treatment plant building was damaged although the machinery inside was relatively unscathed. In addition, fuel facilities, the circulating water intake system, piping and control cables, and concrete foundations for forced draft fans were damaged.

Current Condition. The station now has all four of the 210 MW units back on line. **A.3.5 Najaf Gas**

Turbine Power Station. The station is located in the city of Najaf. On 30 August, Qamhieh al Tallaq inspected the station, and interviewed Mr. Shaker and Mohammed Mahmood, engineer and general manager.

Pre-War Condition. Najaf had a maximum capacity of 189 MW from three 63 MW gas turbine generators.

Damage Report The station was attacked twice and badly damaged. On 20 January at 11:30, Unit 1 was directly hit, Unit 2 badly damaged, and Unit 3 lightly damaged. Common facilities at the site were hard hit. Gas oil tanks were destroyed, the warehouse with spare parts was destroyed, the administration building cable trench and cable were razed. Fifty percent of the turbine hall steel was degraded. On 27 January at 12:10, the generating units were further damaged, as was the control room. The switchyard

including circuit breakers, towers, switches and local control panels were destroyed.

Current Condition. Najaf is currently unable to generate any electricity. Units one and two were the most severely damaged and are inoperable. Wreckage on these units includes the piping systems, control systems, transformers, combustion chambers, and air duct and filter systems. Although Unit three was only lightly impaired, some spare parts are required to place the unit in service.

A.3.6 Musayeb Thermal Power Station. The station is located in Musayeb, about 70 km south of Baghdad. On 31 August, Mr. Abdel Qamhieh and Mr. Kamel al Tallaq inspected the station, and interviewed Zeyah Ishaq, engineer and general manager, and Ala'e Omran, industrial safety engineer.

Pre-War Condition. Musayeb, built by Hitachi (Japan) and British companies in 1980–81, is the second largest power plant in Iraq. Its total 1280 MW capacity comprises four 320 MW steam units. The station fed power through two 400 kV lines to Baghdad West and two to Hilla, two 132 kV lines to Kerbala, and one each to Iskandariya and Latifia.

Damage Report. The station was the object of five attacks between 17 January and 5 February. At 19:50 on 17 January, steam unit one was severely damaged by a direct hit, and units two and three were badly damaged by a bomb that fell between them and also destroyed the turbine room crane. The 400 kV substation was also directly hit, as was the switchyard and the administration building. The station ceased generation after this attack. The same day, the station was hit again at 16:25 and 20:40, further damaging units one and two, setting fire to fuel station facilities. On 26 January, the water treatment plant was destroyed and the control and relay rooms badly damaged. On 5 February, the substation was hit again, and four houses in a nearby workers' complex were destroyed.

Current Condition. Unit 4 is the only unit now capable of operating, having been repaired with parts were taken from other units. Unit three is scheduled for a hydro test in September, but the turbine rotor remains in England where it was shipped for repairs before the war. Unit two had a direct strike on the turbine generator as well as severe damage to the boiler. Unit one has severe damage to the control systems, power transformer along with other minor damages.

A.3.7 New Rumaila 132 kV Substation. The substation is located south of Basrah. On 27 August, Mr. Qamhieh and Mr. Al-Tallaq inspected and photographed New Rumailah, and interviewed Riad Majid, electrical engineer and manager of the South Network.

Pre-War Condition. The substation has two 132 kV and fourteen 11 kV and 33 kV lines, and two 50 MVA transformers. It is an interconnector between the 132 and 33 kV systems in Basrah.

Damage report. The substation was bombed and sustained extensive damage that put it entirely off line. Much damage was caused by ground fire in addition to the bombing.

Current Condition. The substation still is not functioning. An abbreviated listing includes power 14 transformers, circuit breakers, CTs, PTs, line relays, station battery, disconnecting switches, lightning arrestors, insulators, hardware, and control cables.

A.3.8 Amara 132 kV Substation. This substation is located outside Amara in al-Majer district. On 26 August, Mr. Normand, Mr. Dallal, and Mr. Ryan inspected and photographed the station, and interviewed Samir Abdullah Baish, general manager, Faisal Abood, watchman. Earlier on 26 August, Mr. Qamhieh and Mr. Al-Tallaq inspected and photographed the station, and interviewed Kareem, maintenance supervisor.

Pre-War Condition. This substation, built in 1977 by a German company, has two 132 kV, line one to Old and New Amara, line two to New Amara and Basrah via Gorna. It has six 33 kV lines, including lines to the Misan paper factory, the Amara sugar factory, and the Kahlaa brick factory, and six 11 kV lines, including lines to the Misan beer factory and Amara soft drinks factory. The substation uses two winding 35 MVA transformers.

Damage Report. Both Mr. Baish and Mr. Abood reported that the station was bombed after the cease-fire, at 23:30 on 28 February. The southern part of the station had been hit by a cluster bomb, which damaged transformers, circuit breakers, high tension wires, two capacitors, the administration building, and the control room, both 132 kV lines.

Current Condition. Much of the damaged equipment has been patched or replaced with parts from damaged stations in Kut, Ramadi, Baghdad, and Basrah. One 132 kV line is energized. It was repaired with parts from the other 132 kV line.

A.3.9. Miscellaneous. Mr. Qamhieh and Mr. Al-Tallaq observed 53 400 kV steel towers in the south region that were completely damaged. Extensive damage to the 132 kV transmission lines was also observed.

TABLE 1.
Sites Visited: Type and MW Capability

SITE	TYPE STATION	MW CAPABILITY		%
		PRE-WAR	CURRENT	
DIBIS	Gas Turbine	6 @ 35	2 @ 35	26
	Thermal	4 @ 15	0	
MULLA ABDULLAH	Gas Turbine	12 @ 20	11 @ 20	92
TAZA	400 kV S/S	–	–	
MOSUL-MANSUR	Gas Turbine	12 @ 20	6 @ 17	43
MOSUL-YARMOUK	Gas Turbine	500 (total)	200 (total)	40
MOSUL	400 kV S/S	–	–	
MOSUL	Distribution in city	–	–	
SADDAM DAM	Hydro-Main Unit	4 @ 187.5	2 @ 187.5	37
	Hydro-Reg. Unit	4 @ 15	no visit	
	Hydro-Pp. Storage	2 @ 100	0	
ERBIL	Distribution in city	–	–	
BEIJI	Thermal	6 @ 220	5 @ 164	62
SAMARRA	Hydro	3 @ 28	1 @ 28	33
TAJI	Gas Turbine	7 @ 20	2 @ 20	29
DAURA	Thermal	4 @ 160	1 @ 120 1 @ 160	51
	Gas Turbine	4 @ 25	4 @ 25	
AL QADISSIYA	Hydro	6 @ 110	1 @ 60 1 @ 50	17
AL WAZIRIYA	132 kV S/S	–	–	
KHOR AL ZUBAYR	Gas Turbine	4 @ 63	2 @ 45 1 @ 35	50
NAJIBIA	Thermal	2 @ 100	1 @ 45	23
AL HARTHA	Thermal	4 @ 200	0	0

AL NASIRIYAH	Thermal	4 @ 210	4 @ 210	
AL NAJAF	Gas Turbine	3 @ 63	0	0
MUSAYEB	Thermal	4 @ 320	1 @ 320	25
NEW RUMAILA	132 kV S/S	–	–	
AMARA	132 kV S/S	–	–	
TOTAL MW		8805	3665	42

Sites Not Visited

SITE	TYPE STATION	PRE-WAR	MW CAPABILITY	
			CURRENT	%
DOKHAN DAM	Hydro	4 @ 100	0	0
HILLA	Gas Turbine	7 @ 20	7 @ 20	100
DURBENDOKHAN DAM	Hydro	2 @ 40	2 @ 40	100
7 SMALL STATIONS	Gas Turbine	80 (total)	?	?
TOTAL MW		700	220	31
MAXIMUM CAPABILITY	NET	9505	3885	41
PEAK LOAD		5162	3500	68

SOURCE: Site inspections and corroborated interviews during site inspections

TABLE 2.
Sites Visited: Dates, Interviews, Inspectors

DATE	SITE NAME	PERSONS INTERVIEWED	TEAM MEMBERS
26.08.91	Dibis Thermal & Gas	– Hussein Sultan station manager – Fatima Showkut engineer – unknown security guard	– Julia Devin lawyer – Marcella David lawyer – Joel Stettenheim photographer – Johannes Schoonhaven cameraperson – Caren Kuiper cameraperson
26.08.91	Dibis Thermal & Gas	– Jennie Jabbour chemical eng. – Mohamed Salem network maint. eng. – gas plant supervisor	– Warren Piper elect. eng. – Walid Doleh chem. eng.
28.08.91	Distrib. Directorate of North Region-Mosul	– Zeid Wafiq tech. manager – Habib Kiriakus control center eng.	SAME
27.08.91	Mosul-Mansur Gas chief eng.	– Amer Izildin	SAME
27.08.91	Mosul 400 KV S/S	– Amer Izildin chief eng. – Manaf Yassin reconstruction eng.	SAME
27.08.91	Mosul-Yarmouk Gas	– Amer Izilden chief eng. – Yaraleh Yasem station manager	– Marcella David lawyer
03.09.91	Mulla Abdullah Gas	– Hader al-Jumaily station manager – Sirwan Said mechanical eng.	– Roger Normand law student – Mubadda Dallal law student
26.08.91	Taza 400 kV S/S	– Sahban Faisal Hahjub S/S manager – Yousef Yousef O/H line sec. HD.	– Warren Piper electrical eng. – Walid Doleh chemical eng.
28.08.91	Saddam Dam Hydro – Abdel Haq Taha operation eng.	– Mohamed Ismail station manager	SAME
31.08.91	Dhaura Thermal and Gas	– Fayik Mustafa	SAME

		reconstrion manager	
30.08.91	Najaf Gas	– Mohamed Mahmood site and station manager – Mahmood Shaker maintenance eng.	SAME
29.08.91	Beiji Thermal	– Raed Ghazi station manager – Abdel Jadaan planning sec. HD. – Kathem S/S eng.	SAME
30.08.91	Samarra Hydro	– Khaled Saleh station manager	SAME
31.08.91	Taji Gas	– Aiser Habib station manager	SAME
31.08.91	Musayeb Thermal	– Zeyah Ishaq station manager – Ala’e Omran industrial safety eng.	SAME
31.08.91	Al Waziriya Sub	– Abdul Salaam maintenance eng. – Yousef Salman al-Obaidi senior technician	– Roger Normand law student
29.08.91	Al Qadissia Hydro	– Hassan chief eng. – unknown maintenance eng.	– Hedwig van Heck lawyer – Saad Hamid lawyer
26.08.91	Amara 132 kV S/S	– Mr. Kareem maintenance supervisor	– Abdel Qamhieh electrical eng. – Kamel Al-Tallaq chemical eng.
26.08.91	Amara 132 kV S/S	– Samir Abdullah Baish station manager – Faisal Abood watchman	– Roger Normand law student – Mubadda Dallal law student – Andy Ryan photographer
27.08.91	New Rumaila 132 kV S/S	– Riad Majeed south network director	SAME
27.08.91	Khor Alzubair Gas	– Hahism Mouly station manager – Sabah Atteya mechanical eng.	SAME
27.08.91	Najibia Thermal	– Noor Al-Deen Tawfeq Basra Power Generation	SAME

		<ul style="list-style-type: none"> general manager – Eng. Reyad Husein South Electric Network General Manager. – Saleem Saleh station manager 	
28.08.91	Al Hartha Thermal	<ul style="list-style-type: none"> – Abdel Amer Aboud deputy station manager – Yaarub Jassim senior operation eng. 	SAME
29.08.91	Al Nasiriyah Thermal	<ul style="list-style-type: none"> – Husam Haleem senior operation eng. – Adela Mahde civil eng. – Suhel Najem electric eng. 	SAME
01.09.91	Al Nasiriyah Thermal	<ul style="list-style-type: none"> – Husam Haleem senior operation eng. 	– Abdullah Mutawi law student

Table 3.
Sites Visited: Bomb Damage

SITE	TYPE STATION	NUMBER	[ATTACKS]	
			FIRST DAY	LAST DAY
DIBIS	Thermal & Gas Turbine	05	24 Jan.	10 Feb.
MULLA ABDULLAH	Gas Turbine	03	25 Jan.	18 Feb.
TAZA	400 kV S/S	01	17 Jan.	17 Jan.
MOSUL-MANSUR	Gas Turbine	>1	?	?
MOSUL-YARMOUK	Gas Turbine	06	17 Jan.	12 Feb.
MOSUL	400 kV S/S	?	?	?
SADDAM DAM	Hydro	>1	17 Jan.	?
BEIJI	Thermal	02	17 Jan.	18 Jan.
SAMARRA	Hydro	01	07 Feb.	07 Feb.
TAJI	Gas Turbine	03	17 Jan.	18 Jan.
DHAURA	Thermal & Gas Turbine	02	17 Jan.	18 Jan.
AL QADISSIYA	Hydro	04	18 Jan.	28 Feb.
AL WAZIRIYA	132 kV S/S	01	27 Jan.	27 Jan.
KHOR AL ZUBAYR	Gas Turbine	02	17 Jan.	>17 Jan.
NAJIBIA	Thermal	01	17 Jan.	17 Jan.
AL HARTHA	Thermal	13	17 Jan.	28 Feb.
AL NASIRIYAH	Thermal	03	25 Jan.	>5 Feb.
AL NAJAF	Gas Turbine	02	20 Jan.	27 Jan.
MUSAYEB	Thermal	05	17 Jan.	05 Feb.
NEW RUMAILA	132 kV S/S	?	?	?
AMARA	132 kV S/S	01	28 Feb.	28 Feb.

SOURCE: Corroborated interviews during site inspections

WATER AND WASTEWATER SYSTEMS' SURVEY

by

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October 1991

**WATER AND WASTE WATER SYSTEMS SURVEY
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1. SYNOPSIS. Between 24 August and 3 September, the Water Study Team conducted a survey of the water and wastewater systems in Iraq to assess the current status of these systems and the degree to which they have been affected by the Gulf Crisis. The survey consisted of unannounced and unescorted inspections of water and wastewater treatment plants, distribution systems, and collection systems in all regions of Iraq. During site visits, team members interviewed responsible personnel and inspected and photographed all major elements of the site.

This report analyzes data collected during this survey. The findings are: (1) the water treatment plants are operating at 30–70% design capacity primarily due to a lack of spare parts, (2) chlorine is being rationed at all plants with supplies on hand varying from a few days to four weeks, (3) operational capacity of water systems will deteriorate to 5–10% of capacity within months due to lack of parts, chlorine, and regular power supply, and (4) wastewater systems in Baghdad and in the governorates south of Baghdad are operating at 0–70% capacity, (i.e. some plant were not operating at all) with lack of spare parts and electricity as the main rate-limiting factors.

Team members visited 13 cities inspected 28 facilities, including 18 water treatment plants (WTP), eight wastewater treatment plants (WWTP), one water supply facility (WSF), and one alum (aluminum sulfate) plant. They found that much of Iraq's water and wastewater systems are currently inoperable or ineffective. Water treatment plants currently function at a fraction of their former capacities, with only one of the 18 plants visited operating at 100% capacity. Many wastewater treatment plants have ceased operation altogether. Water distribution suffers from reduced flows and limited chlorine. The sewerage collection systems are partially operational due to the array of problems caused by the shut-down of lift stations during the war. These problems are likely to reoccur as lift stations are again shut down for a lack of spare parts.

Direct physical damage, either from the bombing or from looting during the civil uprisings, was found to be only a minor factor in the impairment of water and wastewater systems. The primary rate-limiting factors are lack of spare parts and supplies of chlorine and erratic electric supply.

The impairment of water and wastewater systems has profound public health and ecological consequences. Reduced water flows in the water distribution systems increases the frequency of cross connections¹ and promotes the incidence of water-borne diseases. Insufficient levels of chlorine used to treat the water furthers this spread of disease by depriving the system of an important protective agent.

A lack of electrical power has rendered inoperable wastewater treatment plants in Baghdad and southern Iraq. As a consequence, raw sewage is being discharged into receiving waters. In addition, electricity cuts and a lack of spare parts have severely affected the sewage systems. In many places, sewage back-up and the collapse of sewers has made proper disposal of human excreta impossible. The lack of spare parts affecting sewage transport leaves the rest of the system at continual risk of damage despite efforts to unblock and repair the pipes.

The spiral of public health and ecological problems can be contained by restoring the flow of spare parts and chlorine into Iraq. If present trends continue, the water systems will deteriorate to the point where they cease functioning as part of their respective urban infrastructure. These systems, now operating at only 30–70% of their normal rate, will approach 5–10% in several months. UNICEF and other humanitarian organizations provide spare parts and chlorine, but their efforts are limited and intended as short-term relief only.

2. OVERVIEW This report has four sections: overview, methods, findings, and authors. (**Appendix A**) provides summary reports of site inspections and interviews. (**Table 1**) provides a list of inspected sites' pre-war and current capacity. (**Table 2**) provides dates, team members, and persons interviewed during each site inspection.

2.1 Background The Establishment for Water and Sewage (WSE), under the Ministry for the Interior, is the administrative body responsible for Iraq's water and wastewater systems. The WSE assigns a

director to each governorate. The directors have authority and responsibility for all water and sewage functions within their respective governorate. The exception to this rule is the city of Baghdad, whose water and sewage management is under the mayoralty. The logistical needs for the governorate are handled through the WSE office in Baghdad.

2.1.1 Water Treatment and Distribution Iraq has an effective organization and a modern physical infrastructure of water treatment plants and distribution systems to provide domestic water to its urban population. The urban water systems are capable of providing safe palatable water at the plant and of distributing treated water by networks to individual households. The water treatment plants are limited, however, in their production capacities such that they cannot satisfy water demand from the entire population at once. Therefore, as part of their normal operating mode, the distribution systems are divided into sectors, which rotate in their turns for water. A common pattern, such as at Mosul, is two days "on" and two days "off". The low pressure associated with "off" days creates the potential for cross connections, making the system inherently risky. Under normal conditions, chlorine is added to the systems to maintain the required World Health Organization (WHO) standard of at least 0.5 milligrams per Liter (mg/L) at the far reaches of the distribution system so as to help prevent disease.

2.1.2 Sewerage and Sewage Treatment Most cities north of Baghdad rely on septic tank systems. Two of these cities, Kirkuk and Sulaymaniyah, are about 20% sewerred. The effluent from sewers are appropriated for the irrigation of crops, including lettuce, tomatoes, and other varieties that may be eaten raw. Such practice provides a pathway for an endemic level of disease. Baghdad and the cities south of Baghdad are also sewerred and have sewage treatment plants. The terrain is flat and lift stations are required to avoid inordinately deep sewers. These systems are vulnerable to stoppage of the pumps at the lift stations.

Since the Gulf Crisis and power shortages, such stoppages have caused a litany of sewerage system problems. In general, the treatment plants provide primary or secondary treatment, and function such that the receiving waters are not impacted at problem levels of Biochemical Oxygen Demand (BOD) or pathogenic bacteria. Loss of reliable power supply has caused partial or complete shut down of these plants; a "partially" operating plant has only token effectiveness.

2.2 Objectives The broad objective was to assess the effect of the Gulf Crisis on the physical conditions and the operational capabilities of water and wastewater systems within Iraq. The specific objectives were: (1) to document physical and operating conditions of water distribution systems, water treatment plants, sewerage systems, and sewage treatment plants for selected cities; (2) to determine changes that have occurred since the Gulf Crisis began; and (3) to assess the consequences of the changes.

2.3 Significance An urban area depends on its water system for a number of essential domestic, commercial and industrial functions. Water must be sufficient in flow to safely and adequately satisfy the demand norms of the society. The resulting wastewater must be collected and treated in order to avoid public health hazards or ecological harm. Disruption of the water system in any of a number of possible ways is likely to have serious ramifications for the urban populace. This study assesses the disruptions and the consequences caused by the Gulf Crisis in Iraq.

3. METHODS The study was a field investigation to document by interviews and first hand observations the conditions of the domestic water and wastewater utilities in Iraq with respect to its physical plants and their operating capabilities.

3.1 Scope The study surveyed the condition of water and wastewater treatment systems in major urban areas in Iraq. The sites selected representative the sample of conditions throughout the country. Team members visited 13 cities and inspected 28 facilities over an eight day period from 26 August to 2 September, 1991. In total, the study team spent eleven days in Iraq, from 24 August to 3 September.

3.2 Site Visits Letters of introduction were prepared by the Ministry of Foreign Affairs for the regional governorate and by the General Establishment for Water and Sewage. Government officials did not

accompany the teams on the itinerary. Sites were independently selected by team members to achieve a geographic and operational sample. Interviews were conducted coincident with the site visits to provide orientation concerning the local operation and to review the specific problems. The statements obtained during the interviews were documented by first-hand observations.

3.3 Personnel The water and sewage team (WST) divided into two groups, a north team of David Hendricks and Mohammed A. Sallam, and a south team of Don Hernandez and Abdul-Wahab. Both Eng. Sallam and Eng. Abdul-Wahab are with the Amman Water Department in Jordan. David Hendricks is Professor of Environmental Engineering at Colorado State University, and Donald Hernandez is a consultant to the Oregon Department of Environmental Quality and was formerly WHO Advisor in Baghdad 1978–82. Brief vitae for each person follow the report.

4. FINDINGS The major findings of the survey are summarized in this section. These findings highlight the recurring themes encountered in site visits as reported in (Appendix A).

4.1 Domestic Water Systems

4.1.1 Water Treatment Plants. Each urban region has water treatment plants and the capacity to deliver safe palatable water to the distribution system. This capacity has been diminished by the inability of Iraq to produce the necessary spare parts.

Pre-War Conditions. Most of the domestic water sources in Iraq were surface waters which are treated by conventional rapid sand, i.e., coagulation with aluminum, flocculation, filtration, and disinfection with chlorine. The water treatment plants in both the north and south were producing finished waters that meet or exceed the WHO finished water turbidity standard of 5 Nephthometric Turbidity Units (NTU).

For a few cities, ground water is a major source, or is a supplemental water source, in which case the only treatment is disinfection with chlorine. For both filtered surface waters and groundwater a chlorine residual of at least 0.5 mg/L was maintained in the distribution system. The water deliveries ranged from 135–530 liters per capita per day (L/d/d) (e.g., 135 L/c/d for Kirkuk, 184 for Sulayimiyah, 400 for Baghdad, 530 for Mosul). The new 284,000 M³/d (75 million gallons per day (mgd)) plant at Kirkuk, which is completed and can be placed on line when a few missing electric control parts are received, will generate a per capita capacity of 568 L/c/d. The plants, in general, delivered less than the peak demand for water, either because of shortage of water sources or because the capital investment in plant capacity is not sufficient. The peak demands are in the summer and are caused by the use of evaporative coolers, which consume about 1000 L/d, and garden watering.

Present Conditions. Water treatment plants are operating generally at 30–70% capacity due to lack of spare parts. The spare parts deficiencies ranged from electronic controls to ball bearings, from pump impellers to fiber packing. The most acute condition is at Kirkuk in which the present per capita delivery of water was only 45 L/c/d, vis-a-vis a pre-war delivery of 135 L/c/d. All plants are seriously impaired, however, and are deteriorating as additional pieces of equipment wore out. Replacing parts with those salvaged from inoperable equipment has provided short-term relief, but these supplies are nearly exhausted. The inability to repair failed equipment for lack of spare parts and consequent reduction in water supply has a bearing on public health inasmuch as it increases the risk of cross-connections and promotes the incidence of water-borne diseases. Without spare parts, the number of operative pumps and other equipment will continue to decline until plants are no longer capable of producing water.

The situation has been aggravated by looting that occurred during post-war civil uprisings. In Sulaymaniyah, for example, the Kurds looted much of the equipment and supplies, and the remainder was looted by the Iraqi Army. Even electric wiring was taken in some observed cases. Laboratories were also looted and now lack chemical supplies and instruments. Laboratory control is essential to the proper functioning of any water system.

Lack of chlorine was observed at all of the plants visited. Chlorine supplies at different plants ranged from enough for only a few days to about four weeks. In most cases, the one ton cylinders of liquid chlorine

already in use were the extent of the available chlorine. The chlorine rationing is an important rate-limiting factor in plant operation. Distribution systems must carry a minimum chlorine residual of at least 0.5 mg/L. With the increased risk of cross connection, maintaining this level becomes more imperative. While chlorine is not 100% effective against diseases, a chlorine residual will provide a certain degree of protection against nominal infusion quantities of non-potable water.

Alum rationing has taken place at some plants due to shortages. Supplies are limited by a lack of spare parts used in alum manufacturing. The only sulfur plant in the country, near Mosul, which manufactures alum will be forced to cease operation soon due to its inability to import aluminum hydroxide. Still, aluminum was not seen as an acute problem because the demand is less in the summer with lower turbidity raw waters. The aluminum stocks were sufficient in most cases to last until about December.

4.1.2 Water Distribution Systems. Decreased operational capacities in the water treatment plants aggravates water distribution problems. The cross connection risks are significantly higher with the current 30–70% levels of water production. Although the probable increase in the incidence of water-borne disease was not investigated by this team, it is axiomatic that such risk parallels the increased risk of cross connections. Such a higher incidence of water-borne disease was reported for the city of Ramadi.

The water distribution systems in some cities sustained collateral war damage. Water pipe breaks were frequent during the war. Mosul, for example, sustained water main damage at 24 sites, as indicated in (App.A.3).

4.2. Wastewater Systems

4.2.1 Sewage. Sewage systems have not been constructed for the northern cities, with some exceptions, as noted above. Sewage systems have been installed, however, for Baghdad and southern cities, including Basrah. Because the terrain is generally flat, these systems require lift stations to prevent the sewer depths from becoming excessive. Some sewers in Baghdad were at depths of ten meters.

Pre-war Conditions. The sewer systems were providing effective removal of domestic wastes. For partially sewer systems in Kirkuk and Sulaymaniyah, sewage irrigation with raw sewage was practiced.

Present Conditions. The heavy dependence of Iraq's sewage system on lift stations leaves it susceptible to power shortages. As lift stations shut down during the war, blockages occurred causing flooding from manholes and low sewer outlets; many pipes broke under the excessive water and overburden pressure on the weakened sewer bedding. For example, the Director of Water and Sewage for Baghdad, Director Jabero, reported that Baghdad, with 252 lift stations, suffered 1600 blockages and 470 broken pipes, of which 200 blockages and 259 broken pipes remain.

Removing the many blockages, repairing the broken pipes, and resuscitating the lift stations will require enormous effort. In normal operation, individual problems will occur and can be handled, but never do these failures develop simultaneously throughout a whole system.

4.2.2. Wastewater Treatment. Wastewater treatment plants are common from Baghdad to Basrah. Most of the treatment is secondary biological, i.e., activated sludge or trickling filters, although a few systems are primary only. The systems function such that the Tigris River and other receiving waters are not seriously impaired.

Pre-war Conditions. The wastewater treatment plants that serve the cities have functioned effectively with removals of BOD and pathogenic organisms in accordance with expected norms. The plants resemble those of any city in the United States or Europe, being comprised of conventional unit processes.

Present Conditions. Only one of the plants, the Rustumiyya Sewage Treatment Plant (STP) in Baghdad, sustained bomb damage from the war. Several plants in the south sustained substantial damage in the ensuing civil strife. However, the primary rate-limiting factors on wastewater treatment are power supply and spare parts. An erratic electric power supply in Baghdad and in the south, makes operation difficult.

For example, the aerators for the activated sludge basins at the Rustumiyya STP in Baghdad were not in operation due to a lack of electricity, which permitted untreated sewage to be discharged into the stream which is a tributary to the Tigris river. Flowing south, the consequent pollution causes public health hazards and ecological damage in southern Iraq. Furthermore, even if electric power were restored, the plants would be impaired by lack of spare parts.

5. AUTHORS Matar Abdul-Wahab. Matar Abdul-Wahab is Chief of the Wastewater Treatment Plant Division, Water Authority of Jordan. He has been with the Authority for seventeen years specializing in wastewater, extending from collection system design and operation, to the operation of the Amman treatment lagoon which provides complete wastewater treatment for Amman and Zerka. Eng. Abdul-Wahab is a member of the Jordanian Association of Engineers.

David W. Hendricks. David W. Hendricks is Professor of Environmental Engineering, Department of Civil Engineering, Colorado State University, Fort Collins, Colorado. He has had over 30 years experience in the field of water engineering and has specialized in the areas of water and wastewater treatment in teaching, consulting, and research. In addition to the United States, his consulting assignments include many countries. His publications of journal articles, reports, books, and chapters in books number over 100. He is a member of nine professional organizations related to water and wastewater and is a Diplomat of the American Academy of Environmental Engineers.

Donald J. Hernandez. Donald J. Hernandez is an Environmental Consultant with the Oregon Department of Environmental Quality. He has had over 40 years experience in the field of public health and environmental engineering. In 1944, he served as sanitary engineer in the U.S. Army in Iraq and after leaving the military, in 1966, he joined the EPA for several years. He was assigned to an eight year tour with WHO in Iraq and Saudi Arabia. While in Iraq, he was Advisor to the Minister of Health and helped establish an occupational and environmental health program. He is a member of several professional organizations and is a Diplomat of both the American Academy of Sanitarians and the American Academy of Environmental Engineers.

Mohammed A. Sallam. Mohammed A. Sallam is Control Engineer for the Governorate of Amman, Jordan. His responsibilities include water production, distribution, and water quality monitoring within the system. He heads a team of engineers and technicians to deal with the problem of cross connections within the network. Eng. Sallam has also had experience in design of sewage systems during his earlier years with the Authority. He is a member of the Jordanian Society of Engineers and the American Society of Civil Engineers.

APPENDIX A REPORTS OF SITE VISITS

This appendix contains the data for each of the site visits to water and wastewater facilities in Iraq. The city reports are followed by the aluminum plant report and a UNICEF interview. Information for pre-war conditions was collected in interviews and verified during on-site inspections. Information for current conditions was collected during site inspections.

A.1 Kirkuk The City of Kirkuk, population about 500,000 (estimate by Eng. Agoup A. Hayk, Kirkuk WTP) is about 400 km north of Baghdad in a dry, barren, desert area. On 27 August, Eng. Hendricks and Eng. Sallam inspected and photographed water and wastewater sites in Kirkuk.

A.1.1 Water Treatment. Eng. Abed Al-Salam Daud, Director, Kirkuk Regional Office, Establishment for Water and Sewage (EWS), was interviewed at his office. The system currently operates with severe limitations of water. The higher elevation areas of the city do not get piped water. Rather, the houses have sheet metal tanks about 1 M³ in size that serve as storage for water delivered by tank trucks. Prior to the war, the city had 35 tanker trucks. Now, after the war, only eight are available. EWS provides water about once per week at a cost ranging from 0.01–0.3 dinar/M³, depending upon the quantity (with higher cost beginning at 30 M³). The private sector also is active, providing water at a cost of 40 dinars/M³. The part of the city that receives piped water is divided into ten sections, which receive water about 3 days on, 3 days off. The dry section distribution system is often contaminated during the days without water. Because of the severe shortage of water supply, the service reservoirs that create the pressure zones are bypassed. Maintenance of the distribution system is a problem also, due to lack of replacement parts (Poly Vinyl Chloride (PVC) pipe was mentioned as a specific item).

Kirkuk WTP. The water treatment plant is located near the village of Dibis, about 60 km north of Kirkuk. On 27 August, Eng. Hendricks and Eng. Sallam inspected and photographed the plant and interviewed Eng. Agoup A. Hayk and Eng. Kasim Abbas.

Pre-war Condition. The plant was constructed in 1955 at 3785 M³/d (10 mgd). In 1985 a second plant was completed with capacity 3028 M³/d (8 mgd), giving a total capacity of 6813 M³/d (18 mgd). The second plant is located about one km from the previous plant. The plants have identical treatment trains of rapid mix, flocculation, settling, filtration, and chlorination. The flocculation-settling is done by a reactor-clarifier and the filtration is by pressure filters. The plants were designed by a British firm as an extension of activity related to a nearby oil field development. The plants obtain aluminum from within Iraq and chlorine from within the country or from Germany.

The plants were functioning normally prior to the war with full production of 6813 M³/d (18 mgd). Even at full capacity, however, the per capita water delivery was only about 13 L/person/day. This compares to the United States norm of about 600 L/person/day.

Present Condition. The plants were operating at 2271 Cubic meters per day (M³/d) (6 mgd), about 33% of capacity. Only three of seven pumps (the low lift pumps comprising the raw water intake pumps) were in operation in the 1955 plant and two of four pumps (the pumps that give the head for the hydraulic gradient through the pressure filters) were in operation in the 1985 plant. Electric energy was sufficient and was not rate-limiting, because standby diesel generators were rigged to supply energy. These standby generators were employed after the nearby Dibbis generating station was virtually destroyed by the bombing.

Changes in operational capacity since the war are due mostly to the following: (1) lack of spare parts to permit the normal maintenance of machinery, mainly pumps and motors, (2) lack of spare parts to repair damaged installations, e.g. the transformer station, (3) lack of chlorine supply, without which the plant cannot ensure a finished drinking water that meets expected standards regarding pathogenic organisms.

Sanctions are taking an increasingly harmful toll on the Kirkuk plant at Dibis. A lack of spare parts, including pumps, motors, and electrical parts, has left much of the plant inoperational and incapable of

being maintained. The scraper motor for the reactor clarifier was not operational due to lack of spare parts. Attempts to acquire machine new parts have not been successful. Chlorine is also unavailable. Only two 1000 kilogram cylinders were on hand during the inspection. Since the plants use about 1000 kilograms of chlorine per week, the supply is adequate for only two weeks. The lack of chlorine prevents the final removal of residual pathogens after filtration and leaves water in the distribution system unprotected and more susceptible to bacterial re-growth. The aluminum supply was adequate; a mine near Mosul supplies the aluminum requirements of all plants in the country and is still operational.

With plant flows reduced to one third of pre-war levels, the likelihood of cross connections has risen markedly. The potential for cross connections exist in every water distribution system. (Even in the United States with state and local codes that require back-flow prevention devices cross connections still occur whenever a low main pressure exists). Chlorine residual would normally help to avert the consequences of a small flow from cross connections, but could not protect against large amounts of contamination.

Ground Water. Hendricks and Eng. Sallam inspected and photographed the well field of six wells. Only one was pumping. Lack of spare parts has forced the others to cease operation. The pumping rate for the one in operation was 272 M³/d (50 gallons per minute (gpm)). The water from the well is not being chlorinated due to shortage of chlorine.

Hyundai WTP. The present water treatment plants at Dibis will be replaced by a new 283,875 M³/d (75 mgd) plant about 10 km from Kirkuk, which was completed by Hyundai of Korea. The new plant is a modern facility, similar in layout and appearance to the new plants being constructed in the United States. The water source is a branch of Saddam Canal. The plant is ready to be commissioned except for a few electric control components, which are being held in storage in Turkey due to the sanctions. This new plant would be capable of alleviating the problems of inadequate flows and pressures in the distribution system and would reduce the incidence of cross connections to a level approaching that in the United States.

A.1.2 Wastewater Collection and Treatment. On 27 August, Eng. Hendricks and Eng. Sallam interviewed Eng. Daud regarding the conditions of wastewater treatment in Kirkuk, and then toured the city, inspecting and photographing sewage outfalls.

Pre-War Condition. About 70% of Kirkuk relies on septic tanks and 30% of the residences discharge into open channels. The city does not have a sewage system, but rather several sewage outfalls.

Present Condition. The wastewater disposal practices were not strongly impacted by the war or sanctions since an organized system was not in place. However, the war-related loss of hydraulic jet cleaning equipment has left many sewers blocked, causing overflows and leaving streets flooded with sewage.

Team members inspected one outfall, which consisted of an open ditch covered at the terminus end, discharging into a field where the water was diverted for crop irrigation. The sewage was black in color, and the flow appeared to be 0.014–0.028 M³/s (0.5–1.0 ft³/s). The crops irrigated included lettuce, eggplant, tomatoes, etc. Eng. Daud reported that the Ministry of Health had regulations relative to crop irrigation with wastewater, but that enforcement was relaxed due to the strong demand for the produce, which cannot be obtained from other sources. The practice of irrigation with raw sewage, creates a major health hazard.

The present need for sewerage is not overwhelming, given the low per capita delivery of water, i.e., 13 L/person/d prior to the war. However, the new Hyundai treatment plant will deliver about 500 L/person/d, making sewage indispensable.

Al-Rasheed WWTP. The only sewer area of the city is the Al-Rasheed WWTP, which serves 1500 military family residences. The plant was built by Dumezz, a French company. The plant has not been in operation since March, when it was looted in the civil uprisings. The plant cannot operate until parts are obtained to replace those taken during the looting. Presently, the sewage effluent is discharged, untreated, into the River Al-Khafsha.

A.2 Sulaymaniyah Governorate. The population of Sulaymaniyah is about 700,000. Although the City is under Kurdish control, it has administrative ties to the WSE in Baghdad. The UN presence in Sulaymaniyah is evident. Eng. Hendricks and Eng. Sallam visited Tater and wastewater sites in Sulaymaniyah on 28 August.

A.2.1 Water Treatment and Distribution. Eng. Aziz, Director of the Sulaymaniyah Regional Office of the WSE., was interviewed.

The administration is an office of the WSE and therefore reports to Baghdad and depends on Baghdad to process spare parts requests and for supplies such as chlorine. The laboratory, also at the same location, had an autoclave, jar test apparatus and glassware for wet chemistry. The staff consisted of about six persons. The Sulaymaniyah WSE used to employ 400 water tankers to supply water to the outlying villages. During the civil war, all but four of the tankers were looted during the civil uprising and sold in Iran.

The total water supply to Sulaymaniyah is 128 M³/d (34 mgd). The water distribution system is based on a ration of 0.5–3 hours/d. Pressure in the distribution system is 3–10 bars.¹ Treatment is performed by the Sachinar Water Supply Facility, and an additional surface water source is the River Dukan, with the Dukan WTP treating its water with conventional treatment (flocculation, settling, filtration, chlorination). Dukan is 65 km outside Kirkuk; the study team did not carry out a site inspection.

Sulaymaniyah does not seem to be suffering an acute water shortage, but the water network is in need of maintenance.

Sachinar WTP. At the Sachinar Project Water Supply Facility, Eng. Muhammad Jalal, the plant manager as interviewed.

Pre-War Condition. The water source is a spring, which supplies 64,000 M³/d (17 mgd) to the city of Sulaymaniyah. The per capita water delivery is about 183 L/c/day (50 gal/c/d). The spring emerged as a pond about 4 hectares (10 acres) in surface area. The only treatment used is chlorination. The chlorination was done using a standard metering of liquid chlorine into a small water line about 5cm diameter, which was then distributed to each of the suction pipes by a form of manifold. The pumping station was comprised of 45 pumps in three buildings. Pressure in the operation sections of the system is 20 bars.

Present Condition. The Sachinar WTP is operating at 70% of rated flow, because 30% of the pumps are inoperable due to a lack of spare parts. Twenty of the pumps are over 20 years old and in disrepair. The water appeared clear with the bottom gravel easily visible, although some algae was attached to the bottom rocks. About 10 suction lines, each about 40cm diameter, had intakes 2m below the surface. Chemical and bacteriological analyses of samples were suspended after the war. They have been resumed recently, using a few items of basic equipment, such as an autoclave.

The Sachinar Facility and the offices and labs at the university were looted four times during the civil war. The building was stripped of everything, first by the Kurds and later by the Iraqi Army. Pumps, valves, switches, controls, lab instruments, etc., had to be replaced. The spare parts inventory was completely depleted by looting. Even outside wiring was taken; new wiring along the walls was evident inside the laboratory. Eng. Jalal has presented a UN delegation with five lists of spare parts needed, but so far has received nothing.

John Adlan, a civil engineer with the UN delegation in Sulamaneiyah, stated that the budget for the water system was 8 million dinars before the war, with 3 million for spare parts. Thus about 40% of the budget was to keep equipment going. The war and sanctions cut-off the supply of spare parts, and the consequent looting exacerbated the problem. The system is back in operation through improvisation, and the UN is providing a relief effort to handle the most acute needs. However, the current relief effort is no substitute for the long-term capital investment needed to restore the system to pre-war reliability.

A.2.2 Wastewater Collection and Treatment. Septic tanks are used throughout Sulaymaniyah, though some districts of the city do have sewers. Sewage is used for irrigation.

A.3 Mosul Governorate. On 30 August, Eng. Hendricks and Eng. Sallam inspected and photographed Mosul water treatment plants. Eng. Malallah Suleyman, the Director of the Ninevah Region WSE, whose jurisdiction includes these two plants, was interviewed.

A.3.1 Water Treatment and Distribution. The Tigris River serves as the raw water source for the Mosul plant. The plants are located about 40 kms downstream from Saddam Dam. Raw water turbidity levels are about 5–6 NTU in the summer and are up to 2000 NTU during the winter.

Pre-War Condition. Eng. Suleyman explained that Mosul was served by three plants: (1) Old Left Mosul, built in 1967, (2) Extension of Mosul Left, built in 1981, (3) Unified Water of Mosul (Mosul Right) built in 1981. The Old Mosul and the Extension each have capacities of 56775 M³/d (15 mgd). The Mosul Right plant has a capacity of 151400 M³/d (40 mgd). The total plant capacity is 264950 M³/d (70 mgd), which is 378 L/c/d (100 gal/capita/d). Deliveries to the distribution system was two days on and two days off as a normal mode of operation. Roof tanks on most houses provide water during the intervening days.

Present Condition. Due to a lack of spare parts, only about 30% of Mosul Right is operational, making the present delivery only 45420 M³/d (12 mgd). Thus the present delivery totals only 159,000 M³/d (42 mgd), which is 227 L/c/d (60 gal/capita/d). Although water mains at 24 sites suffered collateral damage from bombing, maintenance crews managed to keep the distribution system in operation. Present delivery is about 70% of the demand because of garden watering and the use of evaporative coolers, which use about 1000 L/d. Team members observed two ton cylinders on line supplying chlorine to the plant. Eng. Suleyman will cease operation of the plants when the chlorine on hand is exhausted. He is trying to obtain 2–4 ton cylinders of chlorine from UNICEF, which has an office in Mosul. Thus, the main problems are: (1) no spare parts, and (2) only three days supply of chlorine on the premises.

A.3.2 Wastewater Collection and Treatment. The city of Mosul does not have sewerage. Septic tanks are used instead.

A.4 Gyara Village On 31 August, Hendricks and Eng. Sallam inspected and photographed the Gyara plant, which sustained direct bomb damage. Gyara is a village of about 10,000 persons located 50 km south of Mosul.

A.4.1 Water Treatment and Distribution. The plant is conventional rapid sand with rapid mix, two clarifiers, and four small filters, the latter being enclosed in a reinforced concrete building. The operator is Mohammed Ali, who lives on the premises with his wife. The water source is the Tigris River, with turbidity ranging from about 10 NTU during summer to about 2000 NTU during the winter.

Pre-War Condition. The plant has a rated capacity of 120 M³/hr, or 2880 M³/d (0.76 mgd), giving a per capita capability of 288 L/c/d. The plant appeared about 30 years old. As a part of the Ninevah Regional Government, it falls under the jurisdiction of Eng. Suleyman.

Present Condition. A microwave tower is located about 1000 M from the plant. A rail line passes near the radio tower. The area was bombed in late January at 1:00. Team members observed a crater about two meters deep and three meters in diameter at the entrance to the plant. The operator, Mr. Ali, and his wife were sleeping at the time of the raid. The house withstood the blast, i.e., the roof and walls were still standing, but had cracks and holes in the concrete walls and pock marks from shrapnel.

The plant has cracked clarifier walls with the reinforcing visible at the top where the delivery channels were without walls. The rapid mix motor frame of small I-beams was twisted. The walls of the building housing the pumping station and filters had holes, no windows, and many pock marks from shrapnel. The plant was not in operation, except for the pumps and chlorine feed. A small package plant is now treating 50 M³/hr. Raw water was being pumped directly, with only chlorination, at 90 M³/hr, making the total delivery 140 M³/hr. Mr. Ali's estimate that the plant was 60% destroyed by the bomb damage was

confirmed by observation. As it now stands the plant is inoperable. The plant probably could be repaired but would require replacement of equipment for the rapid mix, flocculator, and clarifier. Repairing the concrete damage of the basins and the pump station-filter building would require a contractor. The package plant is not producing adequate water, nor is its quality adequate, as alum was not being added. The use of raw water from the Tigris, with only chlorination, is a health hazard. In essence, the village has no alternative to the current unsafe water supply.

A.4.2 Wastewater Collection and Treatment. Team members did not investigate wastewater treatment.

A.4.3 Alum Plant. Iraq's supply of alum is produced by a plant near Gyara, 25 km south of Mosul. The plant's main product is sulfur with alum as a by-product. The team inspected and photographed the plant, and interviewed Eng. Suleyman and Eng. Nouri, the production manager.

Production. The plant capacity is about 45,000 metric tons/year with demand about 40,000 metric tons/year. The major raw materials needed are sulfuric acid and aluminum hydroxide. The sulfuric acid is produced by the plant and the aluminum hydroxide is imported from Italy.

Pre-War Condition. The plant was meeting the aluminum demand of the country. The plant produced three sizes of aluminum for water treatment plants: 2–5 mm size, a medium size, and larger solid chunks. The 2–5 mm size was bagged in 50 kg size for WT plants, but some plants took the aluminum in bulk and mixed a concentrate, *vis-a-vis* solids feed. The standard product had 14.3 waters of hydration.

Present Condition. Production over recent months has been at a rate of only 12,000 metric tons/year, a little over 25%. The aluminum hydroxide stock is only enough to last about four months, so plant managers have requested customers, 95% of whom are WTP's, to conserve on aluminum usage. The biggest factor limiting production is lack of spare parts. The stainless steel belt used to crystallize the aluminum to the degree of hydration desired is out of operation due to lack of spare parts. As a substitute, the product is moved by a blade, with consequent loss of quality control. Also, the reactor vessel will be shut down because of the need for spare parts.

A.5 Ramadi On 1 September, Eng. Hendricks and Eng. Sallam inspected and photographed the Ramadi water and wastewater systems, and interviewed Eng. Jaber M. Salih, Director of Ramadi Regional Water and Sewage Office and Dr. Omar Abdul Satter, Chief of Preventative Medicine for the Ramadi governorate, from whom team members obtained records on distribution system sampling. The Ramadi governorate is large in area and the main urban center is the city of Ramadi (population 500,000), about 160 km west of Baghdad.

The pre-war number of tanker trucks for water delivery has been cut in half (from 20 to 10).

A.5.1 Water Treatment and Distribution. The City of Ramadi is served by three plants with a total capacity of 7000 M³/d (130 L/c/d). The Ramadi WTP, the main plant, is located adjacent to the Euphrates River. The plant is conventional rapid sand.

Pre-war Condition. The Ramadi WTP operated 24 hours/d prior to the war. Chlorine levels in the distribution system were measured at a greater than 0.5 mg/L by Dr. Satter's office prior to the war and coliform samples generally showed no presence. Sampling was about 15/mo.

Present Condition. Due to a lack of spare parts, the plant is producing at only 70% capacity, and 30 pumps are out of operation. The spare parts inventory has been depleted so repair is not possible. The plant suffered minor collateral damage from the bombing of a bridge about 1000 meters upstream. The pumping schedule to the distribution system is 6 hours/d due to the lack of chlorine. Almost every sample obtained from the distribution system has cysts, *E. coli*, and other organisms. Giardiasis is common.

The following table of records was provided by Dr. Satter:

<u>Disease</u>	<u>1990</u>	<u>1991</u> (to 7/31)
Typhoid	128	300
Cholera	0	8
Hepatitis A	150	450

A.5.2 Wastewater Collection and Treatment. Ramadi lacks a sewerage system and uses septic tanks instead. Some rural areas have sewerage. Two sewage treatment plants in the governorate lack spare parts and consequently are inoperable.

A.5.3 Ramadi Water Pipeline. The Ramadi Water Pipeline delivers water into the desert for 500 km to the west. The area is barren, and the pipeline is the only reliable source of water. Water is provided to shepherds, military units, and rural communities. The water source is the Euphrates River and the water is not treated. The pipeline has a main pumping station at the river intake and seven booster stations. Three of the booster stations, B2, B5, and A1, were destroyed by direct hits (see photo documentation). The bombs destroyed the generator room at B2, and the transformer, standby generator, and the entire pump building at B5. A1 was hit by cluster bombs.

A.6 Baghdad. Baghdad, located on the Tigris River in central Iraq, has over 4,500,000 residents. On September 2, Eng. Hendricks and Eng. Sallam interviewed Dr. Adnan Jabero, Director of General Baghdad Water and Sewage Authority, and inspected and photographed selected water and wastewater facilities.

A.6.1 Water Treatment and Distribution. The City has seven water treatment plants with capacities: Karkh 1,135,000 M³/d (300 mgd), Saba Nissan 454,000 M³/d (120 mgd), Basia 190,000 M³/d (50 mgd), Dora 95,000 M³/d(25 mgd), and three small plants of 11000, 19000, 19000 M³/d (3, 5, and 5 mgd). The total aggregate capacity is 1,600,000 M³/d (420 mgd).

Pre-War Condition. Before the war, water production averaged 1,420,000 M³/d or 315 L/c/d. The water treatment plants operated continuously, but demand exceeded production and so the distribution system was operated with a scheduling of two days on and two days off. As in most cities, roof tanks are used to provide water during the off-period.

Present Condition. Following the war, water production dropped to 75 L/c/d, with household use estimated at 25 L/c/d. Standby generators could produce only 25% of plant capacity. Operation was at first only 30 hours per week. At Saddam City (a poor section of one million population), the residents do not have roof tanks so people take water from where they can find it. By April, the electric generating capacity was partially restored and water production increased.

Electric power supply is intermittent and operation in conjunction with the standby power is difficult. Consequently, a formerly continuous supply of potable water has been reduced to intermittent production. The water treatment plants also suffer from a lack of spare parts, and are completely dependent on humanitarian organizations for chlorine. As a result, the chlorine residual has dropped from 4 mg/L to 2 mg/L, leaving 0–0.1 mg/L in the distribution system, vis a vis a normal target level of 0.5 mg/L. Before the war the chlorine/coliform “failure” rate from samples taken was only 0–0.1 percent. At this time the rate is about 15 percent in the region called New Baghdad (southeast). Now the water production is 40–60% of plant capacity, or 150 L/c/d. Lower flows increase the risk of cross connection which is compounded by an inadequate chlorine supply.

A.6.2 Wastewater Collection and Treatment. The City of Baghdad has 1,600 km of networks and two sewage treatment plants, Rusdumiyya and Doura. Capacities are measured in terms of population served. Rusdumiyya serves 3 million persons and Doura serves 1.5 million. The plants are complete mix activated sludge.

Pre-War Condition. The sewerage system has 252 lift stations, 10 major pump stations and 6,000 km of network.

Present Condition. After the war, lift station pumping stopped for lack of electricity. The result was 1,600 blockages, 470 broken pipes, and overflowing manholes. By June, 200 blockages and 259 broken pipes remain. There are no spare parts for the pump station.

Only about 20% of the approximately 100 aeration basins, were operational at the Rusdumiyya. The discharge is directly into a river tributary of the Tigris. The dispersion pattern from the effluent is clearly discernible as a black effluent against a green river water. The Rusdumiyya WWTP sustained bomb damage to one of its lines which has not been repaired.

The sewage collection system is in great jeopardy of total collapse unless spare parts can be obtained to maintain the lift station pumps. Such a collapse would have dramatic public health and economic consequences. The effects would be felt country-wide as the pumps serving different laterals and trunk sewers ceased to function. The discharge of such large flows of untreated sewage into the Tigris and its tributaries is a health and ecological hazard.

A.7 Kut-Wasit. Governorate population was reported to be approximately 57,300, with a population of 150,000 to 200,000 in the city of Kut. On 26 August, Eng. Hernandez and Eng. Abdul-Wahab visited Kut, interviewed Eng. Husein Rosul Jasum, Director of the Wasit Water and Sewage Authority, Eng. Mahdi Abbas, Director of the Water Treatment Plant Laboratory, and operator personnel, and inspected and photographed the Kut WTP.

A.7.1 Water Treatment and Distribution. The central treatment plant draws its raw water from the Tigris River, which is immediately adjacent to the plant. The plant has primary sedimentation (with the addition of aluminum), sand filtration, and gas chlorination. After chlorination the water is discharged from the plant to distribution. Some water goes to two elevated tanks directly, and some goes directly into the system. There is a relatively complete laboratory at this facility staffed by a graduate chemist.

Raw water, from the Tigris, showed general turbidity of 100–110 NTV units, with treated water of 4–5 units. Water is generally chlorinated to 2.5 mgls when leaves the plant. Fecal coliform are normally absent, but range up to 9.2 once or twice a month. Bacteriological work and some chemistry is done daily.

In addition to the central plant, there are 15 small package plants which serve the system. No direct damage was suffered by any of the treatment plants, but there was distribution system damage, primarily at the bridge crossing.

Pre-War Condition. The plant is designed to treat 8,640 cubic meters of raw water 24 hours per day. There were 4 intake and 5 distribution pumps. A 3–4 month supply of chemicals (alum and gas chlorine) was kept on hand. Electric power was not a significant problem but there was some problem getting spare parts, as most parts had to be obtained from abroad. All 15 package plants were functioning.

Present Condition. The plant operates 24 hours a day, at a reduced rate of 5,450 cubic meters a day. All intake and distribution pumps are operable, but pumping with frequent breakdowns. Service has been reduced to eight to ten hours a day, and districts are served on a rotating basis. Engineers report that the chemical stock on hand is now generally a one month supply, often with slow delivery. The plant suffers from frequent surges and variances in power. Spare parts are practically nonexistent. Therefore, only nine of the fifteen package plant are functioning.

Reduced plant output is likely to force people to seek alternative sources of water, many of which will be contaminated. When the distribution system is served on an intermittent basis, leaks and cross connections suck ground water, sewage, and other contaminated water back into the drinking water. Lack of aluminum can hurt the filters and causes increased water turbidity making adequate chlorination more difficult or impossible. Insufficient levels of chlorine will lead to increased incidence of disease.

A.7.2 Wastewater Collection and Treatment. The city of Kut has a sewage collection system for the central part of town, but does not have a sewage treatment plant.

Pre-war Condition. Sewage from the central collection system was pumped by 23 lift stations to the Tigris or Tigris drainage. The remainder of the city has septic tanks or holding tanks. Septage is hauled outside the city and either used for irrigation or just dumped.

Present Condition. There is frequent sewage flooding of the central area due to pump failures, and infrequent power supply. Also, there is now a septage truck shortage causing flooding of home interiors, area roads and open spaces which will undoubtedly cause an increased disease incident. An adequate and continuous supply of power and spare parts is critical to the health of the residents.

A.8. AMARA-MISAN Governorate population is approximately 300,000, with a population in excess of 100,000 in the city of Amara. On 26 August, Eng. Hernandez and Eng. Abdul-Wahab inspected and photographed the water system of Amara-Misan and interviewed Eng. Diduldin Nazem, the Director of the Water and Sewage Authority and Eng. Dathem Mohammed Hasson.

A.8.1 Water Treatment and Distribution. The central treatment plant draws its raw water from the Tigris River. The plant has primary sedimentation (with addition of alum), sand filtration, and gas chlorination. After chlorination, the water is discharged from the plant to distribution. Two elevated tanks “float” on the system, and water is pumped directly into the system.

Raw water shows general turbidity of 100–150 NTU units, with treated water at 5-units. Water is generally chlorinated to 2.5 mg/l, and fecal coliform are normally absent, but do appear once or twice a month. Bacteriological tests are done daily.

In addition to the central plant, there are a number of small package plants serving the system. One of these plants suffered war-damaged. There was distribution system damage primarily at the bridge crossings.

Pre-War Condition. The plant is designed to treat 36,000 cubic meters of water per 24 hour period. There are four intake and five distribution pumps with one stand-by. The plant stores a one-month supply of aluminum and a ten-day supply of chlorine gas. Electric power was sufficient, but it was difficult to acquire foreign-built parts.

Present Condition. Plant production has dropped to 12 hours a day at a reduced rate of 10,000 cubic meters of water a day. Districts are served on a rotation basis. All intake and distribution pumps suffer frequent breakdowns but are operable. When the system is only served on an intermittent basis, leaks and cross connections will suck ground water, sewage, and other contaminated waters back into the drinking water system. One distribution pump is kept operating at all times in an attempt to maintain pressure in the mains. It is reported that the chemical stock on hand is now generally the same as before, with no delivery problems. There are frequent breakdowns of both mechanical and electrical equipment due to power shortages, frequent surges, and variances in power delivery. Spare parts are practically non-existent.

A.8.2 Wastewater Collection and Treatment. There are 28 pumping stations in Amara’s collection system, which pump sewage to the treatment facility. This facility has two 400 l/s and one 800 l/s screw pumps which lift to a screen, sand trap, primary settling, and trickling filter prior to discharge to the Tigris. The plant is rated at 1200 m³/hour. Some areas of the city has septic tanks or holding tanks. Septage is hauled outside the city and either irrigated or just dumped.

Pre-War Condition. Collection system and plant were functioning normally. Electric power was sufficient, although spare parts had to be obtained from abroad.

Present Condition. The treatment plant is only partially functioning and sewage arrives in a highly anaerobic condition. The bar screen is broken, the sand trap is almost full, and only one of two rock filters functions. Many appurtenances are missing or do not work. Reportedly, everything capable of being carried away, including plans, were taken during the civil uprisings. For all practical purposes there is no treatment; the plant’s primary function is transferring the sewage from the city to the river.

In the collection system, there are frequent power and equipment failures causing flooding of streets and homes. The flooding of home interiors, area roads, and open spaces, increases the risk of disease; people are living and playing in raw sewage. A shortage of septage truck leads to flooding other areas as well. Stopped up sewers are another major problem, and cleaning equipment is not adequate or available. All of these problems are aggravated by a lack of parts.

A.9 Basrah On 29 August, Hernandez and Eng. Abdul-Wahab inspected and photographed al Hartha and al Bradiyah WTP's and interviewed Eng. Mohammed Abdul Alsitar Akef, Director of the Water and Sewage Authority, Eng. Ahmed Abdul Kadir, Water Supervisor, Eng. Hamid Kadem Sewage Supervisor, Farouk Abdul Wahid, Operator at the Al Hartha Water Plant, and Jassim Mohammed, Operator at the el Bradiyah Water Plant.

A.9.1 Water Treatment and Distribution. There are two main treatment facilities, one is in al Hartha, thirty miles north of Basrah, and one in al Bradiyah, on the south side of Basrah. In addition, there are some small package plants. All of the plants draw raw water from the Shatt Al Arab River, have primarily settling with aluminum, sand filter, chlorinate, and send water directly to the system. In addition to the main plant, there are one million gallon per day (mgd) package plants: three in Rebat, five in al Jubela, and seven in El Garma. Relatively complete laboratory, bacteriological and chemical analyses are carried out. Raw water has a general turbidity of 10-b NTU with finished water of 1-9 NTV. The water is saline, chlorinated to 2.5 mg/l and both total and fecal coliform are absent.

Pre-War Condition. The water plants together have a design capacity of 70 mgd. Al Hartha has two facilities, a conventional gravity filter plant rated at 20 mgd which delivers water to the system through a 900 mm line, and a set of 25 one mgd package plants which deliver water to the system through a 1000 mm line. The Al Bradiyah facility was built in 1957 and has two parallel pressure filter plants rated at 5 mgd each. Both facilities operated 24 hours a day. Al Hartha had a total of thirteen raw water pumps and thirteen finished water pumps. Al Bradiyah had four and four. Chlorine and aluminum stocking was only five days, since Basrah is a storage center for chemicals. Electric power was not a significant problem but there was some problem getting spare parts as most had to be obtained from abroad.

Present Condition. All plants are still being operated on a 24 hour basis but production is at about 64 mgd or 90% of previous production. Al Hartha has all main pumps functional, but only one of two standby generators and one of four chlorinators are operational. Al Bradian has seven of eight raw water pumps working and five of eight distribution pumps working. In addition, total and fecal coliform testing stopped last July due to lack of culture media.

At all locations there are frequent breakdowns of both mechanical and electrical equipment due to normal wear and tear and to power shortages and frequent surges and variances in power delivery. Spare parts are practically non-existent, as nearly all spare parts are of foreign manufacture and cannot be obtained.

A.9.2 Wastewater Collection and Treatment. Because of the flat land and high water table, Basrah's collection and treatment system employs 33 pumping stations -- nine main stations and twenty-four submersibles. Sewage is collected and pumped to a large main crew pump lift station, southwest of the city. It then goes to the treatment plant further south. There it is lifted and flows by gravity through the primary plant. The facility has 3 screw pumps, screening, sand trap, and settling tanks. Effluent discharges to Al Zubair channel. The plant is rated at 3000 m3/hr. A second (activated sludge) 3000 m3/hr plant was under construction but all work has now halted. Some areas still have septic or holding tanks from which the septage is pumped and hauled outside the city for irrigation or just dumped.

Pre-War Condition. The collection system and plant functioned normally. Electric power was not a significant problem but there was some problem getting spare parts as they had to be imported.

Present Condition. Due to power and equipment failures there is almost constant sewage flooding. Team members observed and photographed much flooding and sewage in the streets, vacant lots, and inside homes. A septage truck shortage adds to the flooding problem. Sewage is being diverted to storm sewers

and discharged at various sites around the city. City personnel report that as many as 600 km of sewers may be plugged, and cleaning equipment is almost non-existent.

At the main pumping station, only one of four screw pumps is operational and there is no standby generator. The generator was destroyed in an attack on an adjacent power facility.

The three screw pumps at the treatment plant are not working, although one might be repairable. Burnt-out motors and irreparable appurtenances have shut this plant down. Raw sewage continues to flow in and now completely surrounds the plant.

Lack of power and frequent power surges and variance in delivery is causing serious motor damage. The sewage treatment plant is shut down and inoperable, and lack of spare parts prevents repair. The diversion of sewage to storm sewers, and shutdown of the treatment facility is causing serious raw sewage flooding in many areas surrounding the city.

A.10 Nasiriyah-Thiqar On 29 August Eng. Hernandez and Eng. Abdul-Wahab inspected and photographed Nasiriyah water and wastewater treatment plant and interviewed Eng. Jabbar Hussein Abdullah, Director of the Water and Sewage Authority, Eng. Hassan Mohammed, Chief Engineer, and Eng. Abu Hail, Sewage Engineer. The city of Nasiriyah is divided into two sections by the Euphrates River. The west bank's population is estimated at 100,000 and the east bank's at 150,000. Each bank has a water treatment and a sewage treatment plant. However, road condition prevented inspection of west side plants, so the following discussion relates only to the east side.

A.10.1 Water Treatment and Distribution. The Al Nasiriyah treatment plant draws its raw water from the Euphrates River. The plant has primary sedimentation (with addition of aluminum), pressure sand filtration, and gas chlorination. After chlorination the plant discharges water to distribution and one elevated tank. A laboratory near this facility carried out chemical and bacteriological tests for the plant.

Pre-War Condition. The plant, constructed in 1957, operated at 24 hours per day at 4900 cubic meters per day. There were four intake and four distribution pumps, and at least one month supply of chemicals (aluminum and gas chlorine) was kept on hand.

Present Condition. The plant is operating at a reduced rate of 3200 cubic meters a day (m³/d), about 65% of capacity. Service throughout the city is now intermittent, and districts are served on a rotating basis. The chlorine chemical stock on hand is now 12–15 days. This facility has at times run out of chlorine and discontinued service. Furthermore, the plant has no aluminum stores, so primary settling is being attempted with no aluminum addition. Lack of aluminum can harm filters, make adequate chlorination more difficult or impossible, and cause greatly increased finished water turbidity, which in turn causes people to seek other sources, many of which are far worse than even a contaminated system.

In addition, the one elevated tank was punctured during the bridge attack on the Al Nasr bridge. The damaged elevated tank constitutes loss of storage and loss of system pressure balancing. The laboratory was also destroyed during the war, and now no chemical nor bacteriological testing can be done. The lack of laboratory facilities deprives the plant of valuable treatment aid and the necessary tools for detecting treatment and distribution system failures and possible introduction of pathogens.

There are frequent breakdowns of both mechanical and electrical equipment due to normal wear and tear and to power shortages, surges and variances in power delivery. Failure to establish a consistent power source will continue to cause serious breakdowns and failures of switches, motors, relays and all other electrical appurtenances. Furthermore, the severe constant breakdowns have caused almost a total depletion of spare parts. Nearly all spare parts are of foreign manufacture and cannot be obtained.

A.10.2 Wastewater Collection and Treatment. Reportedly all collection is by gravity flow to the plant. The plant capacity was designed to serve 87,000 people, but exact capacity was not known. Treatment normally consists of bar screens after which waste is lifted to the sand traps, primary settling, trickling filters, and then discharged to the Mabzal pumping station. This is a 37 mg/hr pumping station which

pumps plant effluent and storm water to the Euphrates. The station has three pumps and generators, all of which are currently in operation. In the city there are still some areas served by septic or holding tanks from which septage is pumped outside the city for irrigation, or just dumped.

Pre-War Condition. Collection system and plant functioned normally. Electric power reliable, and parts were available, though they needed to be imported from abroad.

Present Condition. The treatment plant is shut down completely due to burnt out motors, missing equipment, “frozen” equipment, and almost total destruction and removal of controls. During the civil uprising, all removable components were looted from the plant, including plans and records. Therefore, all raw sewage is by-passed to the Mabzal pump station and discharged directly into the Euphrates.

The complete shutdown of the treatment plant and discharge of raw sewage to the Euphrates constitutes a major health threat to downstream users. A complete overhaul of the plant, and the provision of an adequate and continuous supply of power and spare parts is critical.

A.11 Kufa/Najaf, On 30 August, Eng. Hernandez and Eng. Abdul-Wahab inspected and photographed WTP’s in Kufa and Najaf, and conducted on-site interviews with the Director for both plants.

A.11.1 Water Treatment and Distribution. There are two separate plants co-located at one site and under one Director. One supplies Kufa and the other Najaf. Both draw raw water from the Euphrates River, have primary sedimentation (with the addition of aluminum), sand filtration, and gas chlorination. The Kufa plant has pressure filters but the Najaf plant has gravity sand filters. Each has its own chlorinator but each chlorinator is capable of treating both systems simultaneously. There is also a spare chlorinator. The Kufa plant feeds directly into the system while the Najaf plant feeds a 1,000 m³ reservoir which in turn is discharged to the system. There is a relatively complete laboratory but it was closed at the time of our visit and so no data were obtained. Chlorine levels are maintained at 2.5 mg/l.

Pre-War Condition. The Kufa plant operated at a rate of 21, 600 cubic meters per day, and operated 24 hours a day. There were three intake and three distribution pumps. A three to four month supply of chemicals (aluminum and gas chlorine) was kept on hand. Electric power was not a significant problem but there was some problem getting spare parts, as most parts had to be obtained from abroad. The Najaf plant design was not known. There were three functioning standby generators, any two of which can run both plants. There were also four intake and four distribution pumps.

Present Condition. Both plants were being operated 24 hours a day, and at the pre-war rates. All intake and distribution pumps are operable, but are prone to frequent breakdowns. Service is continuing 24 hours a day but there are frequent low pressure periods when usage exceeds capacity. Plans to increase production have been indefinitely shelved. A one-month chemical stock is kept on hand. There are frequent breakdowns of both mechanical and electrical equipment due to normal wear and tear and to power shortages and frequent surges and variances in power delivery. Spare parts are practically non-existent, as foreign procurement has ceased. These facilities were left intact during the war, but suffered considerable damage during the subsequent civil uprising; it has been repaired.

A.11.2 Wastewater Collection and Treatment. Kufa has a collection system but no treatment plant. Sewage is discharged directly to the Euphrates River. Najaf has a complete treatment facility with screens, sand traps, primary settling, trickling filters, and final settling. The plant discharges into the Euphrates. The plant received no direct damage during the war, but did shut down due to a power failure.

Pre-War Condition. Collection system and plant functioned normally. Electric power was not a significant problem but there was some problem getting spare parts.

Present Condition. Flooding at the lift station at the treatment plant damaged all electrical controls, wiring, etc. During the civil uprising, equipment was destroyed and everything movable was moved including the plant’s plans. The plant is totally stripped and will require a complete overhaul before returning to operation. Consequently, raw sewage is flowing directly into the Euphrates.

The plant's shut down and the consequent discharge of raw sewage into the Euphrates constitutes a major health threat to downstream users. A complete overhaul of the plant, and the provision of an adequate and continuous supply of power and supply parts is critical.

A.12 UNICEF. To develop a more complete perspective on chlorine supplies, Hendricks visited the UNICEF office in Baghdad on September 1 at 1430 hours, and interviewed Rajai Nayjar, who heads the water and wastewater section.

Discussion. Three chlorine-producing plants have ceased operation due to lack of spare parts. On April 1, UNICEF obtained 15 tons of liquid chlorine and 137 tons of chemically-bound chlorine (five to six month supply small plants). In July they received 170 tons of gas and have on order now 540 tons gas. UNICEF estimates that Iraq requires 250 tons/mo of which 120 is needed for Baghdad and 230 for the provinces. In addition to the ordered will be adequate to the end of November.

Most of the plants, including Basrah, have run out of chlorine at one time or another. Villages that use the smaller 65 kg cylinders are out now, but equipment has been requested from Jordan to refill these cylinders from the ton cylinders. The refills are being obtained from Turkey at a plant near Istanbul at a cost of \$800/ton.

UNICEF has set up two study places, supplying and staffing labs at Dahuk and Basrah and is giving Basrah 23 pumps. They are instituting a survey of both water and sanitation of every village over 200 persons.

TABLE 1.
Sites Visited: Type and Capacity

SITE	TYPE	CAPACITY	
		PRE-WAR	CURRENT
A.1. KIRKUK			
Kirkuk Water	WTP	18 mgd	6 mgd
Al-Rasheed	WYP	NA	NA
A.2. SULAYMANIYAH			
Sachinar	Water Supply Plant	NA	NA
A.3. MOSUL			
Old Left	WTP	15 mgd	NA
Old Left Ext.	WTP	15 mgd	NA
Unified Water	WTP	40 mgd	12 mgd
A.4. GYARA			
Gyara	WTP	120 M/Hr	0
A.5. RAMADI			
Ramadi	WTP	100% capacity	70% capacity
A.6. BAGHDAD			
Karkh	WTP	300 mgd	NA
Saba Nissan	WTP	120 mgd	NA
Basia	WTP	50 mgd	NA
Dora	WTP	25 mgd	NA
3 Small Plants	WTP	18 mgd	NA
Total For Baghdad	WTP	315 L/C/D	150 L/C/D
Rusdumiyya	WWTP	100% capacity	20% capacity
Doura	WWTP	100% capacity	20% capacity
A.7. KUT			
Central	WTP	8640 cm/D	5450 cm/D
A.8. AMARA			
Central	WTP	36000 cm/D	10000 cm/D
Amara	WWTP	NA	NA
A.9. BASRAH			
al Hartha	WTP	35 mgd	32 mgd
al Bradiah	WTP	35 mgd	32 mgd

A.10 NASIRIYAH

Al Nasiriyah	WTP	4900 cm/D	3200cm/D
Al Nasiriyah	WWTP	100% capacity	0

A.11 KUFA/NAJAF

Kufa	WTP	21600 cm/D	21600 cm/D
Najaf	WTP	100% capacity	100% capacity

A.12 GYARA

Gyara	Alum Plant	45000 MT/Yr	12000 MT/Yr
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SOURCE: Site inspections and interviews during site inspections

TABLE 2.
Sites Visited: Dates, Interviews, Inspectors

DATE	CITY & SITE	PERSONS INTERVIEWED	INSPECTORS
8.27	Kirkuk Reg. EWS	-Abed Daud Dir. Kirkuk EWS	-Matar Wahab Civ. Eng. -David Hendricks Civ. Eng.
8.28	Sulaymaniyah WSF	-Muhammad Jalal Plant Manager -Eng. Aziz Dir. WSE -John Adlan Civ. Eng. UN	Same
8.30	Mosul WTP	-Eng. Malallah Suleyman Dir. Ninevah WSE	Same
8.31	Gyara WTP	-Mohammad Ali Plant Operator	Same
9.1	Ramadi WTP & WWTP	-Eng. Jaber Salih Dir. WSE -Dr. Omar Satter Chief Preventive Medicine Ramadi	Same
9.2	Baghdad WTP & WWTP	-Dr. Adnan Jabero Dir. W & S Auth.	Same
8.26	Kut WTP & WWTP	-Eng. Husein Jasum Dir. W & S Auth. -Eng. Mahdi Abbas Dir. W.T. Lab	-Donald Hernandez Environmental Eng -Mohammed Sallam Civil Eng.
8.26	Amara WTP & WWTP	-Eng. Diduldin Nazem Eng. Dathem Hasson	Same
8.29	Basrah WTP & WWTP	-Eng. Mohammad Akef Dir. W & S Auth. -Eng. Ahmed Kadir Water Superv. -Eng. Hamid Kadem Sewage Superv. -Farouk Wahid Operator-Hartha -Jassim Mohammad Operator el Bradiat	Same
8.29	Nasiriyah WTP & WWTP	-Eng. Jabbar Abdullah Dir. W & S Auth. -Hassan Mohammad Chief Eng. -Abu Hail	Same

		Sewage Eng.	
8.30	Kufa WTP & WWTP		Same
8.30	Najaf WTP & WWTP		Same
8.31	Gyara AlumPlant	-Eng. Suleyman -Eng. Nouri Production Manager	Same

ENDNOTES:

¹ The concept of “cross connections” is important enough to warrant a brief introduction. The U.S. average water delivery is about 600 liters per capita per day (L/c/d), with the capability to meet peak demands possibly reaching 3000 L/c/d. The idea is to maintain minimum pressures of 35 meters of water head (50 pounds per square inch (psi)), or 3.5 bars in the distribution system, which can be accomplished only by having sufficient water delivery capacity to meet any demand. If delivery of water is less than demand, lower pressures in the mains will result in increasing the risk of disease by lowering the standard of water purity, otherwise known as “cross connections”. Every distribution system carries the potential for hydraulic connections between non-potable and potable water sources. Examples include: a hand held shower immersed in a bath tub of water, and a garden hose lying in a puddle.

¹ A “bar” of pressure is 10 meters of water head.

ENVIRONMENTAL AND AGRICULTURAL SURVEY

The Impact of the Gulf Crisis
on the Environment and Agriculture in Iraq

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October 1991

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1. Synopsis Between 24 August and 5 September, the Study Team conducted a survey of direct and indirect environmental damage in Iraq to assess the environmental effects of the Gulf war and UN sanctions. During site visits, team members interviewed responsible personnel and inspected and photographed the site.

This report analyzes data collected during the field work. The findings are: (1) the breakdown of electric power facilities and water and wastewater treatment plants has created a cycle of contamination whereby untreated waste flows into rivers, which supply an area's drinking water, which leads to high levels of water and waste-borne disease among consumers, and which is eventually cycled back into the river in the form of untreated human waste, and (2) agricultural productivity has been sharply reduced due to the inability to operate the electricity reliant network of irrigation pumping, high soil salinity and acute shortages of fertilizer and seeds. Neither are available because the main fertilizer plant at AL Qaim was bombed and destroyed, and most seeds were imported.

Most of Iraq's population of 18 million is directly exposed to water-borne disease in their potable water supply. Team members, in conjunction with members of the household mortality and nutrition survey, took tap water samples from a total of 158 randomly selected households in all 18 governorates. Each sample was tested for coliform or fecal coliform contamination. The results were 106 positive for gross coliform contamination, 25 confirmed negative, and 27 unconfirmed negative. Roughly half the areas tested, weighted according to population density, showed positive evidence of gross fecal contamination. Only in Baghdad, where coliform media sampling was used, did over half the samples test negative.

For many Iraqis, it is difficult to escape from disease exposure; pathogenic microbes borne in the contaminated water supplies are creating epidemic levels of disease. Prevention is hampered by incapacitated water and sewage treatment facilities and the paralysis of disease vector control programs due to lack of pesticides. Treatment is hampered by shortages in medical supplies and overcrowded facilities.

The situation is bound to worsen as the public health system continues to breakdown and food shortages diminish the population's resistance to disease. To break this cycle of water contamination, the infrastructure of public health and water sanitation must be brought back on line. This would require restoration of electrical power, access to spare parts and replacement equipment, repair and replacement of damaged sanitation systems, and increases in medical supplies, chlorine, other essential water treatment chemicals, and laboratory analysis supplies.

The destruction of the electrical power system in Iraq and the continuation of sanctions have also significantly impacted Iraq's food production. Harvest fields could not be irrigated because the irrigation pumping system ceased to operate when electricity was cut off. Sanctions have prevented all but a tiny fraction of pesticides, fertilizers, seed and farm equipment from entering the country. As a result, the 1990-91 harvest declined 80% from 1989 crop production. The prospects for the 1992 crop production look even worse.

Iraq's livestock and fish population has also severely declined as a result of contaminated water supplies and insufficient quantities of food stuffs and veterinary medicines.

The vast destruction of Iraq's agricultural resources --crops, livestock, and animal wealth -- have thus impeded Iraq's ability to produce food domestically. Whereas Iraq produced 30% of its food needs domestically before the war, today it produces between 10-15% of its needs.

2 OVERVIEW The report has five sections: overview, methods, findings, appendix of sites visited, and tables and charts. (**Appendix A**) provides a list of sites inspected, as well as dates, team members, and persons interviewed during each site inspection. (**Appendix B**) provides summary reports of site inspections and interviews.

2.1 Environmental Background Iraq slopes from the mountainous north to sea level at the Persian Gulf to the south. The climate is arid with a rainy season in the winter months. Year-round temperatures

range from 0 degrees C to 50 degrees C. The Tigris and Euphrates Rivers flow north to south and provide the primary source for potable water and irrigation-based agriculture. Agricultural soils consist of clay loams and silty clays. Groundwater is saline and generally not used for potable water, except in the western desert region, where it also supports irrigation.

2.2 Agricultural Background The Ministry of Agriculture administers the agricultural sector in Iraq. They coordinate food intake and food distribution for all of Iraq's 18 governorates. The three governorates of Arbil, D'Hok and Sulaimaniya are considered autonomous under Kurdish control. Each governorate has an agriculture director that supervises field managers that vary in staff numbers according to the size of the farmable land. The field managers are required to report on the following conditions: crop production; water and irrigation; farm machinery; seed; fertilizer and pesticide supplies; animal wealth; weather; and farmer confidence. Prior to the war, their reports were expected to be submitted to the Governorate agriculture director on weekly basis, and in return the director would submit their report to the Ministry every two weeks.

A census taken every two years determines the state of Iraq's agricultural economy. The last complete census was taken in 1989; the 1991 census has been delayed due to the crisis. 1989 census figures indicated that 35% of Iraq's population was employed in agriculture, while 20–25% was employed in services related to the agricultural industries.

2.3 objectives The broad objective was to assess the direct and indirect environmental damage caused by the Gulf Crisis and to assess and prioritize the environmental risk to the health and welfare of Iraqi civilians.

2.4 Significance Agricultural production and water and sewage treatment systems comprise features of the infrastructure in Iraq that are vital to the survival of the population. The destruction of Iraq's electrical generating system has resulted in the concomitant disruption of these systems. This is directly related to the documented increases in disease, mortality and malnutrition among the Iraqi population. Furthermore, these industries which rely heavily on imports, have not been able to procure parts necessary to repair the damage. While industrial facilities that suffered direct bombing were surveyed, only one environmental release with the potential for great damage to off-site human health and environment was noted.

3 METHODS The study was a field investigation to document environmental conditions in Iraq. Methods used included: site visits, interviews, standardized questionnaires, coliform and fecal coliform testing of drinking water samples.

3.1 scope The study surveyed environmental damage in a selection of major urban and rural areas in Iraq. The sites were selected to achieve a representative sample of conditions throughout the country. Team members visited 24 cities and surrounding areas and inspected over 50 sites over a ten day period from 26 August to 4 September, 1991. In total, the study team spent fourteen days in Iraq, from 24 August to 6 September.

3.2 Site Visits Site visits were authorized by letters prepared by the Ministry of Foreign Affairs for the regional governorates. Officials from the government did not accompany the team on its site inspections. On occasion, the survey team asked local public health physicians to accompany them to provide background information.

Sites were independently selected to achieve a geographic and operational sample and photographic documentation was performed as a part of all site inspections. An effort was made to survey all civilian industrial facilities that suffered direct bomb damage to assess the potential impact of any spills. Interviews with public health and environmental regulatory personnel, facility managers, and local residents were conducted coincident with the site visits to provide orientation concerning the local conditions and to review the specific problems. In addition, data on water supply monitoring, bacteriological and chlorine residue monitoring of water supplies, and morbidity rates were collected on the and governorate level.

3.3 Personnel The environmental team was divided into two groups, with Baghdad as the rough dividing line between north and south. The north team which focused on agricultural production was coordinated by Ross Mirkarimi, an environmental analyst with the Arms Control Research Center, and Mahmoud Al-Khashman, a chemical engineer. The south team was coordinated by Alfred Picardi, a private environmental consultant, and Dr. Laila Abdelnour, a Professor of Chemistry at Amman University. Brief vitae for each person follow the report.

3.4 Surveys A systematic survey was conducted of drinking water supply. Additional surveys were conducted of soil salinity and industrial spillage. Study outlines and questionnaires for these surveys were prepared prior to the mission and amended in the field in response to local conditions encountered. Prior to embarking on field surveys, team members interviewed government personnel responsible for public health, environmental protection, and agriculture in order to obtain background information on country-wide conditions. Team members then independently selected survey instruments and sites.

3.4.1 Water Supply Survey Team members collected drinking water samples at 158 randomly selected households in all 18 governorates in Iraq. The sampling framework of the public health survey team was used to collect drinking water samples. The samples were placed in sterile test tubes equipped with Durham Gas Collection tubes (MPN), in selective nutrient broth for fecal coliforms, or coliforms. The samples were collected according to protocols distributed to the team leaders; team leaders also received training in the sterile methods required for valid sample collection. The purpose of this survey was to develop a picture of water supply sanitation conditions.

4 FINDINGS

4.1 The Water-Borne Disease Cycle In all of the seven southern governorates surveyed, the onset of unsanitary conditions and the increase in water-borne disease followed the loss of electric power in the first days of war. Sewer systems depend on pump stations to move the contents of the water mains to the wastewater treatment plants. The loss of electric power resulted in the backup of the water mains at the pump stations causing sewage to overflow into the streets. The problem has been compounded by solids settling in the now-stagnant pipes.

Although electric power has been partially restored in all of the cities, serious problems remain due to damaged pipes, lack of spare parts to repair pumping equipment, and chronic periodic power outages.

Direct sewage contamination of the water supplies was observed by two routes: (1) wastewater treatment plants not adequately chlorinating their discharges, or bypassing treatment entirely, and (2) infiltration of contaminants through breaks in the water mains. Over 60% of the population in five of the seven governorates surveyed no longer have tap water available in their homes because of low water supply system pressure. The low pressure is caused by lack of spare parts to maintain pumps, power outages, and breaks in the water mains.

In order to reach water supplies, people carry the water from the river, which is often far away or they dig wells in their yards. In some areas, people have dug near the water main, broke a hole in it, and inserted a hose to collect water. In five of the seven cities surveyed, breakage of the water mains and insertion of hoses was common practice. People often have to bail raw sewage out of these holes in order to access the hose stuck in the hole in the water main pipe. Raw sewage that collects in the holes dug to the water mains can infiltrate into the water main itself. Moreover, the practice of breaking into the water mains lowers the pressure in the water supply system further.

Team members documented unsanitary water and waste disposal conditions in all of the cities surveyed in seven governorates. Common conditions observed include: i) solid waste accumulating in the streets due to the lack of collection and landfilling equipment, ii) raw sewage overflows in the street and around homes, iii) raw sewage dumped directly in rivers due to impaired or inoperable wastewater treatment plants, iv) children bathing and playing in these rivers, v) people with little or no tap water supply because impaired or inoperable water treatment and distribution plants cannot generate adequate line pressure, vi) people drawing drinking water directly from contaminated rivers, and vii) people drawing drinking water from

holes dug to water-mains, often contaminated from sewage overflows.

4.1.1 Drinking Water Survey The drinking water survey used the sampling framework of the mortality and nutrition team, which selected 295 random clusters allocated to 18 governorates based on population concentration. Each governorate was subdivided into a district and the random clusters were proportional to the population density. Finally the proportionate random sampling was re-allocated on the basis of subdistricts. Each mortality and nutrition survey team leader was supplied with sterile MPN tubes filled with fecal coliform or coliform selective media. One household tapwater sample was taken at random by the team leaders in most of the clusters. A positive result for the fecal coliform test indicates contamination of the water supply with raw fecal material. A positive coliform test indicates coliform contamination, with a possible fecal source, and is used as an indicator. Both tests are used as indicators of the presence of pathogenic bacteria, with the fecal coliform test providing the confirmation.

Cholera, typhoid, giardia, aemeoba dysentary, polio, hepatitis A, and a variety of other water-borne diseases begin their course in humans with oral ingestion of the pathogenic microbes. Fecal contamination of a water supply is taken as an indicator that disease bacteria could be present.

In all, 158 samples were taken: 27 were unconfirmed negative, 25 were confirmed negative, (no coliform contamination), and 106 tested positive for gross coliform contamination. Coliform media, which gives evidence of contamination, but does not confirm a fecal source, were used in the Baghdad area. Baghdad showed the least indications of contamination of all geographic areas tested.

4.1.2 Under-Reporting of Water-borne Disease Incidence Laboratory conditions in Iraq indicate the possibility of severe under-reporting of contaminated water supplies. Dr. Haithem Abdul-Jabbar, Head of the Bureau of Health Statistics in Dhigar, estimates that the reported Water-borne disease incidence is about one tenth of the actual incidence.

Documentation of the various water-borne diseases in Iraq is usually based on confirmed laboratory analyses. For at least four months, from January through April of 1991, there were very few laboratories in operation throughout the south of Iraq. Currently, shortages of equipment, reagents, and power outages severely limit the laboratory confirmation of clinically diagnosed water-borne diseases. Nevertheless, team members collected data on clinical diagnoses of diarrheal diseases, for all age groups, for corresponding time periods in 1990 and 1991 in order to assess the trend in morbidity of water-borne diarrheal diseases as an indicator of environmental sanitation conditions, and human exposure.

4.2 Agricultural Production

4.2.1 Irrigation Direct bomb damage that disabled some floodgates at control structures in the south, and power cuts that have disabled pumping systems have had a negative impact on soil fertility. Damage to the floodgates that became inoperable because of power outages, caused water shortages upstream and loss of river water for irrigation purposes. Two of the damaged water control structures and one large irrigation pumping station were visited by members of the Environmental and Agricultural Survey Team.

Soil fertility depends on the irrigation system throughout central and southern Iraq. This system controls the water levels that protect crops from flooding. Most of the water used for irrigation comes from the Tigris and Euphrates rivers, and is saline. Flood irrigation of limited duration is used to supply water to the agricultural areas. Extensive flooding caused by the disruption of electricity in irrigation system drainage pumps has led to a great increase in soil salinity. This increased salinity has resulted in a loss of productivity and soil infertility.

Saline deposition is minimized by: (1) short period of inundation, minimizing salt concentration through evaporation and; (2) in many areas, extensive field drainage systems. Mabazel, the drainage system that curbs soil salinity which is dependent upon electricity, regulates the water level by pumping water through a field drainage system. When the field is inundated with water, it leaches through the soil to the subsurface field drains, and relatively saline water is removed from the soil by the field drainage system. The relatively saline wastewater is discharged to the marshes located between the Tigris and Euphrates, and

not back to the rivers.

Power outages have resulted in the long-term flooding of a good percentage of agricultural land, resulting in immediate crop losses and an increase in soil salinity. As power supplies are restored, flooding is being brought under control, but the lack of spare parts and replacements for damaged pumps is once more putting increasing stress on the system. Huge areas of formerly productive agricultural lands have been rendered unproductive or infertile.

Team members estimate that the irrigation network is today operating at 40–50% of pre-war capacity, based on observations of damaged irrigation facilities and canals as well as interviews with local agricultural officers in 15 governorates. A preliminary assessment made in May by the Agriculture and Electricity Ministries determined that 70% of the irrigation systems were inoperable. This assessment has been corroborated by subsequent investigations by UN Envoy Prince Aga Khan's special missions and international relief organizations.

4.2.2 Crops Iraq's main crops are wheat, maize, barley, rice and other grains. Fruits and vegetables vary in abundance. Crops are planted twice a year, in October and May. A healthy harvest depends on proper irrigation and a sufficient supply of fertilizer, pesticides and farm machinery.

Prior to the war, 28 million dunams of farmable land yielded an annual harvest that satisfied the food needs of approximately 30% of the population, according to official figures. Iraq imported the remaining 70% of its food needs, primarily from the United States and New Zealand.

Following the embargo in August of 1990, the Ministry of Agriculture recommended the farmers increase planting of wheat and rice by 30%, in order to cushion anticipated shortages in supply. However, due to erratic power supply and shortages in fertilizer, pesticides, and seeds, agricultural production has declined precipitously. For example, rice production decreased by 70% in the June 1991 harvest. While 236,000 tons of rice were harvested in June of 1990, for example, in June of 1991, only 132,000 tons were produced.

The following (Chart 1.) estimates an 80% decrease in agricultural production for the 1991/92 harvest. The projections are based on information collected randomly from farmers in 16 governorates regarding their ability to plant for the October 1991 season. Local records on the availability of agricultural supplies, and information from the Ministries of Agriculture and Planning regarding import feasibility of supplies. The forecast for the 1990/91 harvest made by UN Envoy Prince Aga Khan in July of 1991 was verified by information collected from regional agricultural field directors and local farmers.

CHART 1.
CROP PRODUCTION
(area in '000 hectares, production in '000 tons)

CROP	1989/90*	1990/91**	1991/92***
Barley			
- area	1,995	2,389	1,990
- production	1,854	520	400
Maize			
- area	59	40	30
- production	185	74	59
Wheat			
- area	1,196	2,512	900
- production	1,196	525	290
Rice			
- area	85	88	62
- production	1,854	125	88
TOTAL			
- area	3,335	5,029	2,982
- production	5,089	1,224	837

* Annual Abstract of Statistics, 1990, Central Statistics Organization, Ministry of Planning, Republic of Iraq.

** Initially forecasted by UN Envoy Prince Aga Khan, 15 July 1991, verified by subsequent examination of data by team members in September.

*** Forecasted by Study Team members, September 1991.

In addition, current restrictions have prevented the Ministry of Agriculture from regulating pest infestation through aerial crop-dusting. While farmers would contract with local government agents for the aerial crop-dusting before the war, the central government must now contract for these services with member UN nations. According to regional directors, crops have not been sprayed for pests because of the administrative difficulties of this process.

AREA SPRAYED AGAINST AGRICULTURAL PEST
Area (Donam 000)

1988	2,694
1989	7,735*
1990	10,756
1991	1,200**

* Areas sprayed are recorded in the Ministry of Agriculture, Baghdad and the Agriculture Governorate Field Offices.

** Statistics reflects Agriculture Field Reports in north Iraq, and UN monitoring on aerial spraying to date.

In addition to the inability to protect crops from pests, fertilizer and seed are in low supply. The Abu Ghreib Potato Sees Factory in Baghdad and the Al-Qaim Fertilizer Factory were targets of the bombing. As the following chart indicates, the embargo has halted the import of fertilizers, pesticides, seed, veterinary drugs, farm machinery, and livestock concentrate. (Chart 2.) shows import requirements forecasted by the Ministry of Planning for 1989-91, updated by the UN for 1992. (Chart 3.) shows quantities actually procured for each period.

CHART 2.
AGRICULTURAL IMPORT REQUIREMENTS

Commodity	1989/90*	1990/91*	1991/92***
Fertilizers	269,000	290,000	300,000
Seeds	6,700	6,925	7,000

CHART 3.
PROCUREMENT
Quantity in tons

Commodity	1989/90*	1990/91*	1991/92***
Fertilizers	269,000	48,000	0
Pesticides	6,700	1,155	0
Seeds	59,000	11,220	500
Livestock Concentrate	15,000	2,300	250

* Annual Abstract of Statistics, 1990, Central Statistics Organization, Ministry of Planning, Republic of Iraq.

** Forecasted by UN Envoy Prince Aga Khan, 15 July 1991, verified by subsequent examination of data by team members in September 1991.

*** Forecasted by Study Team members, September 1991.

4.3 Animal Wealth

4.3.1 Livestock Estimates based on interviews with randomly selected farmers in 15 governorates, and on records from the Ministry of Planning indicate a severe decline in animal wealth. For example, in 1986, 10.4 million heads of sheep and goats, and 1.7 million heads of cattle and buffalo were recorded. There has been a 60% decline in sheep and goats, and a 50% decline in cattle and buffalo. The following

(Chart 4.) illustrates the decline.

CHART 4.
ANIMAL WEALTH

Kind ('000s)	1986*	1989*	1991***
Sheep	8,981	9,038	4,160
Goats	1,476	1,882	752
Cows	1,578	1,495	747
Buffalo	141	169	85

* Annual Abstract of Statistics, 1990, Central Statistics Organization, Ministry of Planning, Republic of Iraq.

** Forecasted by UN Envoy Prince Aga Khan, 15 July 1991, verified by subsequent examination of data by team members in September 1991.

*** Forecasted by Study Team members, September 1991.

Several factors have caused this decline in animal wealth. The principal cause of the decline is attributed to the contamination of the water supply which has caused a high incidence of water-borne diseases among the animal population and to the lack of veterinary medicines and vaccines to treat the animals. In addition, there is a shortage of animal feed due to crop failures and import restrictions, resulting in malnourishment and higher incidence of death among the animals. In addition, the cycle of livestock births dropped precipitously. Many animals were smuggled into Iran and Turkey.

4.3.2 Fish Prior to the war, Iraq nursed its fish population for food markets through fisheries or fish farms. Records from the Ministry of Statistics and Planning indicate that there were 1,684 fish farms before the war. Presently, only 237 farms are in operation. The primary reasons cited for the destruction of the fish farms are the shortage of electricity and the lack of foodstuff.

5 AUTHORS

Ross Mirkarimi is the Persian Gulf Project Director for the Arms Control Research Center (ARC) based in San Francisco. Mr. Mirkarimi is a specialist in the environmental consequences of military activity. He has conducted field work in the United States, Checkoslovakia and Morocco. Prior to joining ARC, Mr. Mirkarimi was Director of the San Francisco Nuclear Freeze Zone Coalition. Between 1984 and 1990, he worked for Del Mar Avionics after receiving his BA from Saint Louis University and the Sovietology language program at the Monterey Institute. He is currently finishing his masters in international economics. He has published and consulted on a number of reports and articles.

Alfred P. Picardi. Alfred P. Picardi is a private environmental consultant to financial institutions, private industry, and public interest groups. He has over 15 years experience in multidisciplinary environmental assessments in a broad range of industrial and environmental settings. He has worked with the Environmental Protection Agency, Office of Toxic Substance, the Virginia State Water Control Board, and private consulting firms. He has written over 120 articles and technical reports. Mr. Picardi is a certified hazardous materials manager (CHMM) and a registered environmental assessor (REA) in California.

Laila Abdlenour. Dr. Abdelnour is a Professor of Chemistry, Amman University, Jordan. She received her B.Sc and PhD in chemistry from Glasgow University in Scotland. Part of her research was on organic pollutants in Jordan's water. She joined the Harvard Study Group as a member of its environmental team.

APPENDIX A

TABULATION OF SURVEYED AREAS AND PERSONS INTERVIEWED

Interviews conducted by Alfred Picardi and Laila Abdelnour

<u>Date</u>	<u>City or Site</u>	<u>Person(s) Interviewed</u>
8/26/91	Kut Governorate of Wasit	Dr. Khaled Alkhoury, Head of Division of Preventive Medicine and Environmental Protection
8/26/91	Kut	Abbas Radi Hassun, Deputy Governor Governorate of Wasit Falahia; Salman Yasin Taher, Head of Agriculture (irrigation control); Thyvkar Jawad Kathem Abed, Head of Planning, Agriculture Dept., Wasit; Min'em Halul Kathem, Deputy Head of Land Use, Agriculture Department, Wasit Fadel Al-Wazan, Head of Technical Section, Agriculture Department, Wasit; Dam Engineer (name not obtained)
8/26/91	Textile Factory, Kut	Muhammed Khudair, General Manager
8/27/91	Amara Governate of Maysan	Siddig Ibrahim, UNICEF Project Officer for Amara
8/27/91	Plastics Factory Amara	General Manager (name not obtained)
8/27/91	Sugar Factory Amara	General Manager (name not obtained)
8/28/91	Basrah Governorate of Basrah	Sahel Alma, Minister of Health, Higher Council of Environment; Dr. Rajeh Tamer Saud, Director, Department of Environment; Dr. Majed Mali, Basrah Health Department
8/28/91	Zaitun Housing Development, Basrah	Latif Alwan, Lift Station Operator Alwan Faraj Hachem, Resident Abdula Muhammed, Resident
8/28/91	Khor-Azuber Industrial District Basrah	General Manager, Petrochemical Complex (no name obtained)
8/28/91	Basrah Refinery	N.H. Mukhawar, Director General, Southern Oil Company Refineries 8/28/91

8/28/91	Southern Oil Company Basrah	R.A.H. Jassim, Director General Southern Oil Company A. T. Ibrahim, Manager, Networks A. Salih Mossa, Manager, Operations; A. A. Al-Shimmary, Manager, Finance; R. M. Al-Dibouni, Manger, Engineering,
8/30/91	Water Sample Survey	Radi Ibrahim, Resident Guide Basrah
8/31/91	Nasiryeh, Governate of Dhiqar	Dr. Hazim Yahia Rashid, Director of Medical Centers Dr. Kamel Al-Rukabi, Manager, Maternity Hospital; Dr. Kifah Kamel, Manager of Preventive Medicine
8/31/91	Nasiryeh	Dr. Haythan Sarsan, Manager of Rehabilitation; Dr. Majed Hassasn, Manager, Pathology Lab; Abdul Karim Kasem, Officer, Civil Defense
8/31/91	Nasiryeh	Hajir Muhammed, Resident Shamia Zaki Jamil, Resident
8/31/91	Nasiryeh	Salwa & Abbas Khalaf, Residents Shoulah Residential Area
8/31/91	Nasiryeh, Al-Baker Residential Area	(photos only)
8/31/91	Nasiryeh	Dr. Haithem Abdul-Jabbar, Manager, Bureau of Health Statistics
8/31/91	Nasiryeh	Sadih Ni'meh Karam, Director, Agriculture and Irrigation
9/1/91	Nasiryeh, Mansuria Residential District	(photos only)
9/1/91	Samawa, Governate of Muthanna	Dr. Abdul Hassan, Muhammed Jawad, Muthanna Dept. of Health and Environment, Head of Technical Matters; Deputy Director General (name not obtained); Pediatrician (name not obtained)
9/1/91	Samawa, Governate of Muthanna	Alia Abdul Hussein, Head of Department of Environment Hadi Kathem Abdul Wahid, Deputy Director, Dept. of Agriculture and Irrigation; Shaker Mahmud Allawi, Agricultural Engineer

		Adel Abed Ali, Agricultural Engineer
9/1/91	Grain Elevator Silo Company Samawa	Hassan Jabbar Hassan, Director, Awwad Abed Talal, Laboratory Analyst
9/1/91	“Laborer’s Suburb” Samawa	Photos, resident Alia Abdul Hussein
9/1/91	Oil Refinery, Samawa	Plant Manager (name not obtained)
9/2/91	Najaf Governate of Karbala	Dr. Atallah Mikhlef Al_Salmani Director of Preventive Medicine and Environment
9/2/91	Najaf	Abboud Mahdi Alwan, Head of Environment Division
9/2/91	Najaf	Abboudi Abbas, Head of Communicable Diseases
9/2/91	Mishkhab Dam, Najaf	(photos only)
9/2/91	Kufa Governate of Karbala	Agricultural Soil Samples
9/3/91	Hilla Governorate of Babil	Leila Jassam Mohammad Ali, Head of Environment Section, Dept. of Preventive Medicine and Environmental Health
9/3/91	Hilla	Dr. Zaki Shabala, Director of Preventive Medicine and Environment
9/3/91	Hilla	Dr. Abdula Nasser Al Hasam, Director, Agriculture and Irrigation
9/3/91	Hilla General Director of Health	Dr. Kaddoury Hassan Mankhy,
9/3/91	Kazir Hilla	Backarly Residential District (photos only)
9/3/91	Mahaweel Agricultural Salman District, Hilla	Said Eesa, Director, Planning and Follow-up
	Kish Irrigation System Pump Station	Abdul Kathem Mohammed, Engineer Adil Nabat, Lands Supervisor
9/4/91	Qaim Governorate of Ambar	Ali Dhabib Al-Delaimi, Plant Manager, State Enterprise for Phosphate

TABULATION OF SURVEYED AREAS AND PERSONS INTERVIEWED

Interviews conducted by Ross Mirkarimi and Mahmoud al-Fashman

<u>Date</u>	<u>City or Site</u>	<u>Person(s) Interviewed</u>
8/26/91	Kirkuk/Ta'meem	Nizar, Director of Agriculture Ta-meem; Da'uood Dinkha, Vice Director, Dibis Agriculture Sector
8/26/91	Kirkuk/Ta'meem Water Injection Center	Supervisor Huessin
8/26/91	Kirkuk/Ta'meem Dibis Electrical Plant	Abnan Abdullah, Manager
8/26/91	Kirkuk/Ta'meem Kirkuk Waste Site	Muhammad Taqai, manager Karrem Sallej, civilian
8/27/91	Kirkuk/Ta'meem North Oil Co.	Serop S. Sirkissian, engineer F. Saladin, worker
8/27/91	Erbil Textile Factory	Nozat Tawfeeq, technician
8/27/91	Erbil Agriculture Directorate	Agriculture Director (no name obtained)
8/28/91	Sulemaniyah	UN High Commission on Refugees, Agriculture Directorate P. Sarassan; Tariq Nessari Peshmergar, officer; and Dr. Hatem
8/29/91	Sulemaniyah, Said Sadiq, Halabjah Penj ween	Johan Pravick, UN Field Officer UNICEF field analyst (name not obtained)
8/28/91	Derbandi-khan Hydroelectrial Dam	Fa'ouk Sateim, fisherman and farmer
8/28/91	Nainnwa/Mosul Nainnawa Beverage Co.	Jawdat Dawood, technical manager
8/28/91	Nainnwa/Mosul Mosul Dairy Product Plant	Bassam Dabbagh, technical manager Atim Da'ud
8/29/91	Nainnwa/Mosul Al-Mosul Sugar and Yeast Factory	Moaid Moh'd, vice manager
8/29/91	Nainnwa/Mosul Hamman al-Aleel	Mou'man Abdullah, technical manager

	Cement Factory	
8/29/91	Nainnwa/Mosul Al-Mushrak Sulpher Mine	Abdel Sattat al-Safi Plant Director
8/30/91	Nainnwa/Mosul Mosul Textile Factory	Ghanim Sa'eed, manager
8/30/91	Dohuk/Zahok UNICEF	Jim Reynolds and Kazem Hallel, field engineers
8/30/91	Dohuk/Sarsang Musa Laka, Kurdistan Reconstruction Org.	Salam Nassan's family, farmers
8/30/91	Salah-eddin/Tikrit Beiji Oil Refineries	Ahead Mowfaq, technical manager
8/30/91	Salah-eddin/Tikrit Tikrit Waste Water Treatment	Ahmed Saleh, Water and Sewer Director
8/30/91	Salah-eddin/Tikrit Sammara Pharmaceutical and Medical Supplies	Mohammed Sharif, general manager
8/31/91	Nainnwa/ Mosul	Director of Agriculture and Irrigation; Harim Akmad, farmer; Abdel Sarud, farmer; Abdul Nasser and family, farmers
8/31/91	Nainnwa/Mosul Nimrud Technical Institute of Agriculture	Professor Abdel Rahman Sarmud; Azim Da'oud Wah'd, Technical Assistant; Professor Adrian Younnig Hassan
8/31/91	Rutbah Al-Qaim Fertilizer Factory	Fouad Lalameer, Director of Industrial Chemicals Department
9/1/91	Baghdad Baby Milk Factory	Ahmad Tameen, Supervisor Mr. Assad, Grocery
9/1/91	Baghdad Baghdad Asbestos Industires Plant	Sami Boughous General Manager
9/1/91	Baghdad	Salah Edden Kazem Chief Agriculture Engineer
9/1/91	Baghdad General Establishment for Water and Sewage	Faiq Muza Mosa, Engineer Abdul Salah, Director General
9/2/91	Al-Anbar/Ramadi	Khaled Abdel Latif, Director of

		Agriculture and Irrigation; Abdul Hassan, farmer; Mrs. Sarin Kazem, housewife and farmer
9/2/91	Al-Anbar/Ramadi Al-Anbar Fuel Reservoir	Abbas Hanna, Esq. Mrs. Hadi Ali, resident
9/2/91	Baghdad Modern Paints Co.	Munib Hadi, technical manager
9/3/91	Baghdad National Chemicals and Plastics Co.	Raja al-Bayyari, manager
9/3/91	Baghdad north	Khalid al-Samarabi, farmer
9/3/91	Baghdad Al-Russtumieh Waste Water Treatment	Ahmed Ali, investigator
9/3/91	Baghdad Abu Ghreib, Potato and Seed Warehouse	Names not obtained
9/3/91	Baghdad, UNICEF	Dr. Murzi and Rajai Najjar Engineers Water and Sanitation
9/4/91	Baghdad Al-Doura Oil Refinery	Mowafaq Khalil, technical manager
9/4/91	Baghdad Animal Vaccine Factory	Shehal Huessin-Elawi, worker Mr. Alwan, worker
9/4/91	Baghdad Enviromental Protection Center	Abdel-Kareen Sarraj, Director
9/4/91	Baghdad Ministry of Agriculture	Abdel-Wahab Sabbagh, Minister of Agriculture and Irrigation

APPENDIX B

Selected Site Visits

B.1 City of Kut, Water and Sewage Systems On 26 August, Ms. Abdelnour and Mr. Picardi interviewed Dr. Khaled Alkhoury, Head of Division of Preventive Medicine and Environmental Protection, and inspected and photographed several water supply and water and sewage treatment sites throughout Kut.

Pre-War Condition The governorate has 30 large water treatment plants with capacity of over 250,000 cubic meters/day. In addition there are 130 small plants for outlying villages. A regular monitoring program has been carried out in the past for coliform MPN, E. coli MPN, and starting this year, for vibrio cholera. Samples are taken from the farthest point in the system, mid point, and at the treatment plant source.

Current Condition During the war, civil services, including garbage collection, were effectively suspended. No monitoring was carried out until April, because the laboratories were inoperable due to lack of electricity, supplies, and transportation. The water and sewage systems also depend on electricity, which ceased after 18 January. People obtained water directly from the river. Plants used to treat water with bottled chlorine; they now use hypochlorite. The water supply is underchlorinated, with chlorine residuals often zero (the acceptable chlorine standard is 0.04 ppm at the tap in summer, and 0.02 ppm at the tap in winter). In addition, equipment failure cannot be repaired because of the lack of spare parts.

Since the start of the war, sewage has backed up in the street. Pump stations ceased functioning due to lack of electricity. The untreated sewage drains into rivers and swamps which are used by the population as potable water supply. Team members observed sewage floods in the city on 26 August. Electricity has now been partially restored, and water and sewage treatment facilities are operating at reduced capacities, but coliform counts in drinking water supply are still above acceptable standards (2.2 coliforms/cc).

In areas surrounding Kut, clusters of villages have their own supply system using groundwater and storage tanks. In some of the outlying villages, cracks in sewer lines have caused groundwater contamination. These cracks are attributed to bombing of roads. Furthermore, many of these systems are currently out of operation or at reduced capacity because of pump breakdown and erratic power supply.

There is currently an epidemic of water-borne disease - cholera, typhoid, hepatitis type A, severe gastroenteritis. However, the increase in disease outbreak has been less severe than expected. This could be attributed to enteric pathogen die-off in the natural waters due to pH, or other conditions.

B.1.1 Kut Dam On 26 August, Ms. Abdelnour and Mr. Picardi inspected and photographed the Falahia Dam on the Tigris in Kut, and interviewed Abbas Radi Hassun, Deputy Governor; unknown, Dam Engineer; Dr. Khaled Alkhoury, Head of Division, Preventive Medicine and Environmental Health; Salman Yasin Taher, Head of Agriculture Department, Kut; Jawad Kathen Abed, Head of Planning; Min'em Halul Kathem, Deputy Head of Land; Fadel Al-Wazan, Head of Technical Section, Wasit Department of Agriculture.

Pre-War Condition The Kut Dam is the regulator of irrigation and water supply systems upstream to the north of the Tigris as well as downstream. The dam services the governorate of Wasit, Maysan, and Dhiqar. The irrigation system regulated by this dam shifted water from north to south for seasonal planting of wheat, barley and vegetables.

The dam was bombed twice during the war. At night on 30 January, the east end was hit and damaged. In the morning of 5 February, the dam area was bombed, damaging the central section of the dam, as well as a military hospital, 12 houses, and 33 shops on Al-Hura street along the Tigris near the dam (Photo). As a result of bomb damage to the dam, the irrigation system could not function, and water supplies could not be shifted north for planting. The electrical system that raises and lowers the floodgates was rendered inoperable by bomb damage; the inability to regulate flow prevented irrigation supplies from reaching the higher elevations of the system. Sedimentation is now a problem upstream of the dam. The money allocated for dredging has now been used for other priorities.

After the bombing, a fish kill of thousands of “shabut”, a native fish in the 28” class, was observed in the river. Studies on the possible causes of the fish kill, carried out by the Institute of Food Study, Dr. Abdul Ameer Al-Thamiry, have been inconclusive. Studies have included both bacteriologic and chemical analyses. The irrigation system in this governorate operates on gravity flow, and public water supplies are also drawn from the irrigation canals. Many resources were used drilling wells in an effort to replace lost irrigation waters. However, the groundwater used was more saline than the Tigris waters, limiting the crops which were subsequently planted.

By 26 August, team members observed that the electrical system for seven gates had been repaired; 14 gates out of 56 were damaged in the bombing. Water levels in the system are now reaching design levels, (18msl), and only one area to the north is still not getting the required supply of irrigation water.

The governorate of Wasithas has 1,200,000 dunams of arable land; about 1/4 of this land has been brought back into production. (One dunam = 250 square meters). Production is currently low because of shortages. They lack money to carry out repairs and perform maintenance dredging on the dam. Equipment and materials for reclamation of the soils made saline from groundwater irrigation are also lacking, as are plastic pipes for field drains, spare parts for pumps, and equipment to dig trenches.

B.1.3 Kut Textile Factory On 26 August, Ms. Abdelnour and Mr. Picardi inspected and photographed the textile factory and interviewed Muhammad Khudair, General Manager.

Pre-War Condition Prior to the war, process waste water was combined with sanitary wastewater and put through a primary treatment process before discharged into the river. For a period after the war, this treatment process was bypassed.

Current Condition The raw material chemical warehouse of this facility was bombed, and the structure and contents burned to the ground. There was a transitory air pollution event during the fire, which lasted for four days. Products burned included hydrogen peroxide, sulfuric acid, dye materials, and caustic soda. There is no housing in the immediate vicinity of the building, and exposure to toxic products of combustion would have been limited to personnel on site during the fire.

The site has been cleaned up and is now fully operational. Some of the clean-up materials were wasted to the sewer, and others were buried onsite. Since there is no groundwater usage in the vicinity of the site, the potential for environmental impairments from landfilling of this waste is low.

B.1.4 Kut-Amara Highway Between 17:00 and 18:00 on 26 August, while driving from Kut to Amara, Ms. Abdelnour and Mr. Picardi observed and photographed five groups of women collecting drinking water from irrigation ditches or the Tigris River.

B.1.2 City of Amara, Water-borne Disease On 27 August, Ms. Abdelnour and Mr. Picardi inspected and photographed water and wastewater treatment plants and several sites related to water supply in the environs of Amara, and interviewed Siddig Ibrahim, UNICEF Project Officer for Amara District.

Pre-War Condition Eighty per cent of Amara’s residents have their household waste channelled into open sewers which discharge directly to the Tigris, the rest are serviced by a sanitary sewer system. Outside the city itself, there are 9 small water treatment plants supplying the outlying districts. Before, the war, all but a handful of villages were supplied with treated water.

Current Condition The Amara sewage treatment plant is not currently operating; since the bridge to the wastewater treatment plant has been severed. As a result, sewage has backed up into the streets of neighborhoods. Team members inspected one high-rise development and observed ground floor apartments flooded with sewage. The wastewater treatment plant needs treatment chemicals and pumps as well as before operations could resume.

About 50–60% of the residents of Amara and outlying villages are now drinking polluted water as a result

of the electric power breakdown, which incapacitated water treatment systems. The electrical power lines from Basrah are still cut.

B.3 City of Basrah

B.3.1 Water and Sewage Treatment On 28 August, Al Picardi and Dr. Laila Abdulnoor of the environmental team inspected and photographed a sewage pump station and several residential areas. In the Zaitun district, they interviewed Dr. Rajeh Tamer Saud, Director of the Basrah Department of Environment in the Ministry of Health, Mr. Latif Alwan Faraj, the sewage pump station operator, Mr. Alwan Faraj Hachem, and Mr. Abdullah Mohammed, local residents.

Current Situation Mr. Picardi and Ms. Abdulnoor observed acres of sewage pools and sewage overflow in several residential areas. The local sewage pump station currently operates only from 07:00 to 19:00. Only one out of four pumps at the station is in working order; according to Mr. Faraj at the sewage pump station, the other three were damaged by vandalism during the civil uprising.

In addition, solid waste is now accumulating in the city, with an increase in disease vectors. Solid waste was previously transported out of the city by trucks, but most are now out of order. The government currently relies on volunteers in municipalities to bury garbage at local dumps. Bulldozers are unavailable.

A local resident, Mr. Hachem, explained that sewage began to overflow into the streets as soon as electrical power was cut. In addition, tap water was stopped. Mr. Hachem was currently receiving his drinking water from a hose stuffed in an intentionally broken watermain.

Mr. Abdullah Mohammed, also a local resident, reported that his sister has contracted cholera four days ago, and that his children had diarrhea and were vomiting. None of the children were vaccinated, because the hospitals no longer have vaccines available.

Dr. Saud of the Department of the Environment, reported that the majority of people in both rural and urban areas in the governorate had treated drinking water supplies before the war. Since the war, most water treatment plants operate at reduced capacity because of power cuts, lack of spare parts, and lack of chlorine. As a result, drinking water in the governorate is currently below W.H.O standards for the following reasons:

1. Limited operation of water treatment and wastewater treatment plants because of erratic power supply.
2. Broken water supply and sewage pumps cannot be repaired because of the lack of spare parts and interrupted maintenance.
3. There is infiltration of sewage into the watermains when the sewers back up and flood.
4. There is inadequate chlorination for water treatment.

The quantity of water in Basrah is adequate, but quality is poor because of bacterial contamination and lack of chlorination. At the outer reaches of the water supply system, chlorine residual levels are below the 0.5 ppm W.H.O standard, for drinking water. Because many of the water supply pumps are inoperable, people on the periphery of the town and in the villages rely on untreated river water for potable supply.

The salinity of the public supplies has increased, because the normal flow of water in the area has been disrupted. The normal flow of water in the area has been disrupted. The floodgates in the south Basrah Dam could not be regulated due to power cuts; currently, however, partial operation of the gates has been restored. In addition, temporary bridges stopped the normal flow of water.

Increased salinity has also alleged the soils; residents reported they could not grow vegetables in their gardens since the war. Farmers reported that the irrigation system stopped at the beginning of the war when the power failed, resulting in crop failures.

A.3.2 Basrah Oil Refinery On 28 August, Mr. Picardi and Ms. Abdulnour inspected and photographed the Basrah Oil Refinery and interviewed the Assistant Director of the Refinery. The Director

reported that the refinery was set on fire by Allied aerial attacks starting from January 17th. There is a residential area nearby the refinery for employees. Some family members of employees were killed in the attacks, some were killed by suffocation from the massive fires. The air pollution from the fires has largely subsided; when the spills first occurred there was evident revolatilization from the spills. A large area of soil, approximately 2 km x 2 km is still contaminated by petroleum spills. The volume of the spill is estimated at 250,000 cubic meters. Spills originated from process and storage equipment, routed through the facility sewer system and overflowed at the API separator.

There remains a huge lake of petroleum product standing on the soil. According to facility personnel, in the winter months when the spill occurred, there was a rainwater component as well, which filled the area of the spill up to the level of the road grade. Groundwater is used in the vicinity for irrigation, as the nearest wells are 30 km to the north. If the groundwater represents a resource in current or potentially future use, the oil spill represents a serious potential for extensive environmental damage. Environmental damages could also result from contaminated groundwater discharge to local surface water. This is the worst case of environmental contamination resulting from war damage documented during the survey of the southern section of Iraq.

B.5 Tameem Governorate

B.5.1 Agriculture Pre-War Environment: Kirkuk and Dibbis are the two major agricultural towns located in the Ta'meen Governorate, the most productive agricultural region in the country. Both towns are irrigated through the Dibbis Irrigation Project, which irrigates land from the south of Kirkuk and the northwestern and southern regions of Arbil through sixty-two irrigation stations. The Saddam Irrigation Project, located near Sulaymaniyah, serves as a backup irrigation system, and serves areas north of Kirkuk and southeast of Arbil. However, this backup system is unequipped to provide enough irrigation for the entire Dibbis/Kirkuk region. The region also relies on annual rainfall for irrigation.

According to Mr. Dinkha and Mr. Hassan, Kirkuk, an agricultural town in the Ta'meen governorate, is plotted to cultivate 1,856 million dunams of land. Farmers who rely on rainwater require 800 kilos/unit (one unit = 120 dunams) of seed to plant their crops. Farmers relying on the irrigation network need approximately 250 kilos/unit of seed.

Post-War The interviewees reported that 75–80% of the region's harvest was ruined in 1991, as a result of war-time conditions. The bombing of the Dibbis Electrical Power Plant caused the regional field drainage system to break down. Civil strife and sanctions have stymied efforts to repair the drainage systems and damaged farm equipment.

Bombings and sanctions have left less than 400,000 dunams of plotted land suitable for cultivation. According to the interviewees, bombing in the area and sanctions have destroyed 83% of the resources that support the local agriculture industry. Over 100,000 dunams of farmable land, grain silos, food factories, nearby residences, and the Dibbis Water Treatment Station were directly bombed. Mr. Mirkarimi visited these bombed sites in the region.

Currently, farmers relying on rainwater have only 200 kilos/unit of seed available to them; those reliant on the irrigation system have only 20 kilos/unit of seed. Only thirty irrigation stations are currently in operation. Mr. Mirkarimi visited nine of these stations. Two were directly bombed, and seven were inoperable due to a lack of electricity. Sanctions have prohibited the import of needed seeds and spare parts necessary to repair the irrigation system.

Mr. Mirkarimi interviewed four farmers who have lost their farms due to Allied bombing, unexploded ordinances, and lack of supplies. According to one of the farmers, three farms in the vicinity were bombed and also received unexploded ordinances on 26 and 29 January. These farms are surrounded by other farms to the north, south, and west, and bordered by a road to the east. No other facilities or installations were visible within a 15 km vicinity of the region. When authorities from the Governorate Director's office detonated the unexploded ordinances, the surrounding crop field was set on fire.

B.5.2 Animal Wealth According to the farmers interviewed, bombing and sanctions have caused their livestock populations to dwindle. Mr. Mirkarimi visited three barns destroyed by impact from bombing. Shrapnel from cluster bomb units was visible. According to the farmers, the bombing claimed 190 cows, over 400 sheep and goats, and an undetermined amount of poultry.

According to Mr. Abdul Hassan, a fish farmer in Kirkuk, allied bombings of irrigation canals and electrical plants have resulted in untreated water deposits directly into the fish streams, and resulted in the destruction of tens of thousands of fish. Mr. Mirkarimi visited two river sources for fishing, and interviewed several fish farmers. They reported that the fish population had severely declined as a result of the pollution of the fish streams from a nearby factory.

INCOME AND ECONOMIC SURVEY

By

Jean Drèze
Haris Gazdar

October 1991

ABSTRACT

The destruction of the economic infrastructure and an acute shortage of imported inputs have caused a considerable decline of output and wage employment, especially in the private sector.. The reduction of formal employment opportunities, and the general improveishment of the population, have led to a large-scale expansion of “informal” self-employment (e.g. street-vending).

Overall, money earnings have remained more or less unchanged for the majority of the population since August 1990. Over the same period, consumer prices have sharply increased, due to trade restrictions, exchange-rate depreciation and reductions in subsidies. The food price index has risen by 1,500 to 2,000 per cent. Correspondingly, real earnings have fallen to less than seven per cent of their pre-crisis level, in terms of purchasing power over food. In terms of private incomes, the incidence of poverty is now greater in Iraq than in, say, India. The collapse deterioration of many basic public services, including health care, water supply and sewage.

These adverse developments have been partly compensated by the expansion of public food distribution. Iraq's public distribution system, which covers all residents, except in areas not currently administered by the government, is equitable and efficient. However, food distribution covers at best one half of the nutritional needs of the population. Many households have to sell their assets to complement food rations with market purchases.

The paralysis of economic activity and basic public services, inadequately compensated by food rationing, has led to widespread nutritional deprivation and a sharp increase in mortality. For the January-August period, mortality rates among children under the age of five were three to four times as high in 1991 as in 1990.

This study, sponsored by the World Institute for Development Economics Research (WIDER) and the London School of Economics, is a contribution to the International Study Team report on the effects of the Gulf Crisis on the civilian population of Iraq. We are grateful to Ms. Rana Zobi and Mr. Jubran Ibrahim for skilful translation services, and to all members of the International Study Team (especially Elisabeth Benjamin, Bela Bhatia, Julia Devin, Steven Donziger, Eric Hoskins, Mary Kavar, Roger Normand, Megan Passey, Mariam Shahin, and Sarah Leah Whitson) for help with the field work as well as for their support and advice. We are also indebted to Robin Burgess, Jacques Drèze, Stephen Howes, Nicholas Stern and Sheila Zurbrigg for helpful comments on an earlier draft.

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1 INTRODUCTION

1.2 Motivation and Focus The Gulf Crisis has caused much devastation - human, environmental and material. Bombings have been the most spectacular source of such devastation, and their impact has received much attention. But it is plausible that economic dislocation (partly a result of the bombings themselves) caused more widespread sufferings, especially among those who were more deprived and vulnerable to start with. As a poor woman told us in Basrah after describing the torment of hunger during the war, "you can hide from the bombs, but you cannot hide from your stomach".

Unlike the bombings, economic chaos in Iraq is far from over. The continuation of economic sanctions compound the delayed effects of the war in retarding the process of economic recovery. The current debate about the future course of these sanctions largely motivates this study of the impact of war and sanctions on economic activity and human well-being in Iraq. Aside from informing this debate, we hope that this study will complement other contributions to the International Study Team report in providing a reliable overall picture of the human consequences of the Gulf Crisis.

Our study concentrates primarily on the ability of the Iraqi population to satisfy its basic needs, especially the need for adequate nutrition. This focus is quite natural, since undernutrition and related deprivations have become quite widespread in recent months. Dealing with this problem of endemic poverty and hunger is surely the first priority in the immense task of economic reconstruction that Iraq has to face.

1.3 Sources and Methodology The research underlying this report is largely based on independent field work carried out in Iraq between 23 August and 7 September, 1991. During this period, we travelled without restriction throughout the country, and carried out diverse investigations with the help of an interpreter of our own choice.¹ Aside from a large number of interviews with household members, factory managers, UN personnel, relief workers, government officials and others, our field work included a food consumption survey covering 58 households (more than 500 individuals) dispersed through the country.

As far as secondary sources are concerned, we have made use of several statistical documents produced by the Government of Iraq prior to the crisis, and of some independent reports written since the end of the war (e.g. the Ahtisaari report and the Aga Khan report). We have also used secondary data gathered in Iraq from non-government sources (e.g. factories and relief agencies). Statements and data obtained from government offices in the course of our visit have been used sparingly, and always with an explicit mention of the source. Our aim has been to rely as much as possible on sources that are relatively immune from manipulation, and to use other sources with great circumspection.

The analytical framework of this report draws on notions that have been widely applied in recent research on hunger and poverty in developing countries.² We consider that the ability of households or individuals to satisfy their basic needs (including adequate nutrition) depends on their "entitlements" to the relevant commodities (in the case of nutrition, these commodities would include food, drinking water, health care, sanitation, etc.). The entitlements of different households reflect what the system enables them to acquire through various channels such as production (e.g. growing food), market exchange (e.g. buying food), or public distribution (e.g. food rationing).

In Iraq, households derive their entitlements to food and other basic commodities from two crucial sources: (1) private income, and (2) public provisioning. For most households, private income is earned mainly through employment (either wage employment or self-employment); entitlements from this source depend quite crucially on variables such as production, labour demand, wages and prices. Important forms of public provisioning in this context include health services, educational facilities, epidemiological protection, water supply and food rationing. Given that other contributions to the International Study Team report deal with these public services in some detail, we have decided to concentrate on what we regard as the most important form of public involvement in the provision of basic needs in Iraq: the system of public food distribution. Employment and the public distribution system are, thus, the two central themes of our analysis.

1.3 Outline of the report The outline of the report is as follows. Section 2 describes the main features of the Iraqi economy, and its evolution through war and sanctions since August 1990.³ The process of economic recession, and its impact on employment and wages, is examined more closely in Section 3. We find that real labour earnings (deflated by a food price index) have dropped by a factor of at least 15 during the last twelve months. A large majority of workers in Iraq now earn real wages lower than those of, say, agricultural labourers in rural India. This finding leads us, in Section 4, to consider the role of the public distribution system in protecting the population from starvation. Our assessment is that, contrary to popular belief, Iraq's public distribution system is an exemplary one in terms of coverage, equity, efficiency, and amount distributed. As things stand, however, it covers at best one half of the nutritional requirements of the population. Section 5 discusses the living conditions of Iraqi people during and since the war. There is every indication that famine conditions prevailed during the war, when both market acquisition and public distribution of food were severely disrupted. After the war, the general nutritional situation improved somewhat, as food prices declined from their war-time peak and public distribution resumed. However, this momentary improvement has not led to a sustained process of economic recovery. Poverty and nutritional deprivation remain endemic, and, for the poorest sections of the population, life continues to get harder and harder. Section 6 presents the conclusions, and relates them to current debates about the future course of economic sanctions.

2. BACKGROUND

2.1 The Iraqi Economy⁴ Oil has dominated all areas of the Iraqi economy at least since the sixties. It made up over 90 per cent of Iraq's exports until the imposition of sanctions one year ago. At its peak the production capacity has been over 3 million barrels a day, and Iraq has proven reserves of more than 100 billion barrels. Most oil-related activities take place within the public sector, and proceeds from oil exports are the most important source of government revenue. Despite its financial predominance, the oil sector provides direct employment to just over 1 per cent of the workforce (**see Figure 1**).

During the last twenty years, agricultural production and employment have respectively stagnated and declined. At the time of the last census in 1987, agriculture (together with forestry and fishing) employed only around 12 per cent of the workforce. This decline reflects a rapid expansion of employment opportunities in the cities and high rates of urbanisation. Iraq, which was until only some thirty years ago a predominantly rural and agrarian society, now has over 70 per cent of its population in urban areas.

Agricultural production has been plagued with instability, as the main food-growing areas lie in the rain-fed northern regions (non-food production represents only a very small part of the agricultural sector). There is only one cropping season, and the harvest is almost totally dependent upon the timing and adequacy of rainfall. In the irrigated areas of the south, environmental problems like water-logging and salinisation have held back production.

In a good year like 1988, which saw a bumper harvest, cereal production in Iraq covers about 40 per cent of total consumption (the corresponding proportion for wheat, the main staple, is about 25 per cent). A poor harvest like the one experienced in 1989 could barely cover 15 per cent. In recent years, food imports have tended to hover around 25 per cent of total merchandise imports.⁵

Early industrial development was largely in the public sector. This included both capital-intensive heavy industries, such as iron and steel, petrochemicals (centred around Basrah which has Iraq's main sea port), and fertilizers, as well as consumer-goods industries - many of which are involved in processing and packaging imported raw materials. Much of the industrial activity around Basrah was disrupted during the Iran-Iraq war with the destruction of the port. Another consequence of that war was the rapid development of industries related to military production.

The service sector (public and private combined) is by far the largest employer in Iraq. Almost fifty per cent of the total workforce was in this sector in 1987 (see Figure 1). Though desegregated data are not available, it is fair to assume that quite a large number of the service-sector employees were, in fact, army conscripts.⁶ Many others are in civilian public services including administration and the well-developed social services such as health and education. Social services in Iraq are acknowledged by most observers

as among the best in the region, and doubtless employ large numbers of people.

Taking together employment in public-sector industries and in public services (excluding the army), the government is by far the most important employer (see Table 1 for data on public-sector employment by Governorate). Its capacity to function as such ultimately depends upon oil revenues. These also indirectly support a great deal of private-sector activity, to the extent that foreign exchange earnings from oil sales are used to pay for imported raw materials and equipment. The public sector therefore provides a direct and critical link between oil production (and export) and the rest of the Iraqi economy.

The long war with Iran had a distorting impact on Iraq's economy, and slowed down its development. For a period of ten years large financial and human resources were diverted towards the war. Labour shortages were dealt with by large-scale immigration of workers from Egypt, Sudan and other countries (a majority of these foreign workers left Iraq soon after the invasion of Kuwait).

In the aftermath of the war with Iran, there was a brief period of re-organisation and reconstruction before the events of last year undermined the development prospects of the country. During these two peaceful years, substantial changes were initiated in the economy. Ambitious privatisation programmes were implemented in the agricultural sector as well as in light manufacturing. Starting in 1988, nearly all industries producing consumer goods for the domestic market were handed over to private concerns (often with former managers retaining a key role). This should not be taken to mean that state involvement with consumer industries ended; as will be seen further on, the private industrial sector continues to rely on the government for foreign trade activities.

The economy was still in a process of transition at the beginning of the recent crisis in August 1990. The state sector remained the main engine of economic activity, and the main linkage between national oil revenues and private incomes, in spite of the beginnings of change towards greater market orientation.

2.2 The Impact of the Gulf Crisis The impact of the Gulf Crisis on the economy of Iraq go back to early August 1990 when, following the invasion of Kuwait, Resolution 661 of the UN Security Council urged all member states to enforce a strict embargo on all imports to and exports from Iraq. The only items excluded from this embargo were “supplies intended strictly for medical purposes, and, in humanitarian circumstances, foodstuffs”.⁷ The same resolution also set up a Committee of the Security Council (hereafter the Sanctions Committee), “consisting of all the members of the [Security] Council”, to monitor the embargo and “to report on its work to the [Security] Council with its observations and recommendations”.

Resolution 666, passed a few weeks later, clarified the circumstances and modalities under which food might be exempted from the embargo on exports to Iraq. After “emphasizing that it is for the Security Council, alone or acting through the [Sanctions] Committee, to determine whether humanitarian circumstances have arisen”, Resolution 666 states:

if the [Sanctions] Committee, after receiving the reports from the Secretary-General, determines that circumstances have arisen in which there is an urgent need to supply foodstuffs to Iraq or Kuwait in order to relieve human suffering, it will report promptly to the Council its decision as to how such needs should be met; ... in formulating its decisions [the Sanctions Committee] should bear in mind that foodstuffs should be provided through the United Nations in co-operation with the International Committee of the Red Cross or other appropriate humanitarian agencies and distributed by them or under their supervision in order to ensure that they reach the intended beneficiaries.⁸

In the absence of a decision by the Sanctions Committee to recognise the existence of urgent humanitarian needs, it was impossible, before and during the crisis, to deliver any foodstuffs, even baby milk, to Iraq without violating the embargo. This embargo, it should be mentioned, was strictly applied by the neighbouring countries, these countries were all hostile to Iraq, with the exception of Jordan, whose opposition in the conflict was far too delicate to allow any detectable violation of the sanctions. Illegal smuggling may well have taken place, but certainly not on the scale required to meet a substantial

proportion of the enormous food needs of the Iraqi people - more than 10,000 tones per day for foodgrains alone.⁹

An effective embargo also applied to medical supplies until well after the end of the crisis. This was due to a number of factors including the blockade of the port of Aqaba, the difficulties involved in obtaining formal exemptions from the Sanctions Committee, and the Committee's extremely narrow interpretation of the term "supplies intended strictly for medical purposes".¹⁰ The consequences were particularly tragic during the crisis, when disastrous living conditions prevailed inside Iraq and yet humanitarian supplies were almost entirely cut off (with the notable exception of one UNICEF convoy) as a combined result of bombings and the embargo.

The Gulf Crisis gave the coup de grace to an economy already crippled by more than five months of rigorous sanctions. Bombings caused extensive damage to the economic infrastructure, including oil refineries, power plants, bridges and telecommunications. War damage and continued sanctions led to a virtual collapse not only of general economic activity and employment but also of basic public services such as health care, water supply, food distribution, sewage and sanitation.¹¹

In March 1991, an official UN mission led by Under-Secretary-General Martti Ahtisaari visited Iraq and Kuwait, and submitted a report to the Secretary-General on the humanitarian needs of these countries (hereafter the "Ahtisaari report"). This report, echoing earlier reports of WHO/UNICEF and the Gulf Peace Team, warned that "the Iraqi people may soon face a further imminent catastrophe, which could include epidemics and famine, if massive life-supporting needs are not rapidly met".¹² After reviewing the damage caused by war and sanctions on essential civilian services, the report recommended that Iraq should be allowed to import food as well as a number of other items closely related to essential civilian needs (e.g. spare parts and equipment to restore water supply and sanitation systems).

Resolution 687 of the UN Security Council (the "ceasefire resolution" of early April) effectively endorsed these recommendations.¹³ It determined that foodstuffs could henceforth be imported by Iraq on simple notification of the Sanctions Committee, while "materials and supplies for essential civilian needs as identified in the [Ahtisaari] report" could be imported under a simplified "no-objection procedure". On the other hand, the same resolution also reaffirmed Resolutions 661 and 666. The general embargo on imports was to be reviewed every sixty days by the Security Council "in light of the policies and practices of the government of Iraq".¹⁴

As far as exports are concerned, Resolution 687 states that the embargo continues until the Security Council is satisfied that Iraq has completed all actions demanded by the same resolution. These actions relate mainly to the destruction of weapons. However, it also empowers the Sanctions Committee to approve exceptions to the prohibition against exports from Iraq "when required to assure adequate financial resources on the part of Iraq" to import essential commodities exempted from the embargo on humanitarian grounds.

Since the end of the Gulf Crisis, many assessment missions have visited Iraq and produced reports on the living conditions that now prevail in different parts of the country. These reports show an amazing degree of agreement on the basic facts: the economy is devastated; public services have severely deteriorated; people are ill, undernourished, unemployed, impoverished and demoralised.¹⁵ The earlier report of the International Study Team (May 1991) itself documented a public health catastrophe, and estimated that the number of excess deaths among children aged under five in 1991 might turn out to be as high as 170,000.

The latest report, produced by an official UN mission led by Prince Sadruddin Aga Khan in mid-July (hereafter the "Aga Khan report"), provides sector-wise estimates of Iraq's financial needs "not only concerned with addressing immediate requirements of humanitarian scope and nature, but also with averting a crisis in the next six to twelve months".¹⁶ A careful reading of the report suggests that the assessed "needs" include the resources required to repair war damage in essential sectors of the civilian economy such as power generation and telecommunications. These needs, calculated over a one-year period, add up to US \$22 billion (of which US \$3.6 billion for food, health care, water and sanitation). Under a more conservative scenario of "greatly reduced services", the report arrived at a total figure of US

\$ 6.85 billion for a one-year period (of which US \$2.4 billion for food, health care, water and sanitation). The report recommends that Iraq should be allowed to use funds from limited oil sales (or from blocked accounts), under United Nations supervision, in order to import a range of commodities (specified in the report) required “to alleviate the priority needs identified by the Mission in the areas of food supply, health services, water and sanitation and power generation, the oil sector and telecommunications”.¹⁷

It is partly in response to these recommendations that the Security Council recently adopted Resolution 706 (15 August, 1991), allowing Iraq limited sales of oil and oil products over a period of six months. The proceeds of these sales are to be spent on essential humanitarian imports under UN supervision, after deduction of an appropriate sum for war compensation, weapons destruction and related purposes. The resolution states that the size of the allowed sales should be “sufficient to produce a sum to be determined by the [Security] Council following receipt of the report of the Secretary-General requested in paragraph 5 of this resolution but not to exceed 1.6 billion United States dollars”.¹⁸ The report requested in paragraph 5 is expected to describe the measures necessary to implement the resolution, as well as “estimates of the humanitarian requirements of Iraq”.¹⁹

The report in question was submitted in early September. As far as human requirements are concerned, this new report essentially reaffirms the findings of the Aga Khan report. Confining itself to the most basic humanitarian needs, it states:

In conclusion, taking into account food and agricultural input needs, as well as requirements for health, water, sanitation and supplemental feeding programmes, the total estimate of humanitarian requirements is \$ 1.73 billion net of deductions for the other purposes stipulated in resolution 706 (1991).²⁰

The needed “deductions” are estimated in the same report at US \$ 666.3 million. Bearing in mind the limit of 1.6 billion imposed by Resolution 706, the report concludes with implacable logic:

The amount of \$ 933.7 million estimated to be available for purchase of humanitarian assistance is approximately \$ 800 million below the revised estimates of \$ 1.73 billion [for essential humanitarian requirements].²¹

Elsewhere, the report adds:

In the light of these findings, the Security Council may wish to review its earlier decision to limit Iraq oil sales to \$ US 1.6 billion.²²

In spite of this recommendation, the Security Council reaffirmed the limit of US \$1.6 billion when it reviewed and approved the procedures suggested in the Secretary-General’s report for implementing Resolution 706.

3. EMPLOYMENT AND INCOMES

3.1. Introduction and Overview

As was explained in the introduction, the poorer sections of the Iraqi population earn their income predominantly through employment: either wage employment (as in the industrial and tertiary sectors) or self-employment (as in the “informal” sector and much of the agricultural sector). Real earnings from employment depend on three variables: the employment rate, the level of money wages, and the price level.²³

At the risk of some simplification, and considering the workforce as a whole, one can say that, since August 1990, these three variables have evolved as follows: (1) the level of employment has more or less stagnated, (2) money wages have also roughly stagnated, and (3) prices have increased very sharply. The net result has been a dramatic reduction in real earnings.

While examining the diverse forces that have produced these overall trends, it is convenient to begin by

considering wage employment in the secondary and tertiary sectors. In these sectors, employment has considerably declined during the last twelve months due to shortages of raw materials, spare parts and power supply.²⁴ Over the same period, money wages have remained unchanged in the public sector, and have risen only marginally in the private sector.

The decline of wage employment in the industrial and tertiary sectors, however, has led to a roughly corresponding expansion of self-employment in the “informal” sector, especially street vending. Most of those who lost their former jobs in the industrial and tertiary sectors have taken up an informal income-earning activity of some kind. Indeed, remaining idle is now a luxury that few can afford.

Information collected in the course of our field work indicates that average monthly earnings in the informal sector are now similar to those of unskilled workers in wage employment, and also quite close to what they were one year ago. Thus, the “replacement income” earned by those who have shifted from wage employment to the informal sector is quite similar, in money terms, to their initial income; and for those who have retained their initial occupation, incomes have also remained more or less constant.

Thus, whatever the precise extent of the recent shift towards informal occupations, employment and monthly earnings in the secondary, tertiary and informal sectors combined must have changed relatively little in the last twelve months.²⁵

During the same period, consumer prices have considerably risen. The food price index, in particular, increased by 1,500 to 2,000 per cent between August 1990 and August 1991. These sharp price increases have led to a corresponding collapse of real earnings in the secondary, tertiary and informal sectors.

In agriculture, a different scenario took place. With output prices rising more or less at the same rate as the consumer price index, real earnings must have been approximately proportional to the level of output.²⁶ The latter was well below normal in most areas, due to poor rainfall as well as to other constraints directly related to the war and sanctions (lack of power, spare parts, seeds, fertilizers, pesticides, etc.). Available estimates suggest a decline in output of the order of 70 to 75 per cent compared with the previous year. The implied decline in real earnings is not as large as for the other sectors of the economy. However, given the relatively minor importance of agriculture in the Iraqi economy, the difference in the rate of decline of real earnings between agriculture and other sectors can be ignored without great loss of precision for the purpose of the present argument.

To summarise, real private incomes from employment have been, as an approximation, inversely proportional to consumer prices during the last twelve months.²⁷ In terms of purchasing power over food, private incomes have dropped by a factor of 15 to 20 (i.e. to somewhere between 5 and 7 per cent of their initial levels) since August 1990.

The remainder of this section examines these trends more closely. We begin with a discussion of food prices, before turning to a sector-wise review of the economy. Readers susceptible to being put off by detailed economic analysis may wish to go straight to Section 3.7.

3.2 RECENT TRENDS IN FOOD PRICES Prices of all traded commodities began rising steadily in Iraq following the imposition of sanctions in August 1990. During the crisis they rose very sharply in most areas as frequent air raids and extreme petrol shortages disrupted the transport system and prevented markets from functioning normally. Price movements may be attributed to three factors: (1) short-term local shortages and speculation, (2) quantity constraints on the supply of imported goods due to sanctions, and (3) depreciation of the unofficial exchange rate of the Iraqi dinar.

The first factor was certainly at work during the crisis itself. Though no price surveys were conducted at that time, anecdotal evidence suggests that localised shortages and disruptions led to phenomenal increases in food and other prices during the days of the air raids. Wheat was reportedly sold at over 7 dinars per kg (about 140 times the mid-1990 price), and it may have cost as much as 450 dinars (two months' salary for a skilled worker) to fill up a car's fuel-tank.

These war-time price increases caused acute hardship. Prices did eventually come down in the aftermath of the war as markets started functioning again and transportation was restored. A factor that almost certainly helped in this direction was the removal of petrol rationing and a drastic reduction in the price of petrol (the current level is similar to the pre-crisis one, which is extremely low by international standards).

Food prices nevertheless remained much above the pre-sanctions levels. Some relevant results of our price surveys, which covered rural as well as urban areas in most Governorates, are reported in **Tables 2a and 2b**.²⁸ With the exception of some fresh vegetables, we did not find much variation in the prices of foodstuffs across the country. The lack of significant inter-regional price disparities is indicative of a relatively efficient internal food market.

Persistently high food prices after the crisis have been widely attributed to sanctions-induced limits on the quantum of imports, leading to supply constraints. This explanation is persuasive for the period preceding the lifting of restrictions on food imports in April. According to a market survey conducted by the World Food Programme, the average price of wheat-flour stood at around 6 dinars per kg in March. Since then there has been a decline to the present level of between 2 and 2.5 dinars. This price nevertheless remains 45 times as high as one year ago, and since April there has not been much movement (see **Figure 2**). The persistence of high food prices beyond April relates to drastic changes in the organisation of trade that followed the imposition of sanctions. Prior to the crisis, the government exercised monopoly rights over imports of most foodstuffs. Officially it is claimed that the private sector was allowed to compete directly with public-sector food marketing, but high government procurement prices and subsidised consumer prices made competition well-nigh impossible, at least in the case of the main staple items.

With the imposition of sanctions in August 1990, the private sector became a competitive food importer for the first time. Traders had to find their own sources of hard currency, and this was only possible at the unofficial rates. Even prior to the sanctions the unofficial rate was about 13 times as high as the official one (the price of the Iraqi dinar was fixed at US \$3.2, while in the black market 4 dinars would exchange for one dollar). With the onset of the sanctions the dinar further lost value, and the present rate is around one dollar for 8 dinars. For imported goods that were previously priced using the official exchange rate, market prices can be expected to have risen about 25 times since August 1990 as a result of exchange-rate movements alone. Observed increases for some such items (e.g. wheat-flour) have in fact been much higher. This is due to the loss of government subsidy, which compounds the effect of exchange-rate movements.

It is worth noting that the present price of wheat-flour is in fact close to the price that prevails in Jordan, which is Iraq's main trading partner. This "arbitrage" suggests that quantity constraints on import (and hence supply) are no longer binding. Comparing market prices of other staple foods between Jordan and Iraq, we also find almost complete arbitrage at the unofficial exchange rate. This is a significant point, implying that nutritional deprivation in Iraq is not a question of deficient food supply, but one of inadequate purchasing power.

The fact that food prices in Iraq are now quite close to competitive import prices has another important implication. It suggests that, in the near future, food prices will come down only if the exchange rate rises, or if the government resumes its system of comprehensive subsidies. Neither development seems likely as long as sanctions remain in place in their present form.

The price-index calculations presented in **Table 2a** indicate that food prices as a whole have risen by a factor of between 15 and 20 since August 1990.²⁹ The implications of these price increases for households can be easily seen from the last row of this table. Whereas the average monthly food basket for a family of six persons with one infant cost 66 dinars in August 1990, the same purchases cost over 1,000 dinars today. Even after taking into account the provision of low-price food rations through the public distribution system (see **Section 4**), this figure remains as high as 800 dinars per month.

This estimated cost of maintaining pre-crisis nutritional standards can be usefully compared with current levels of wages in different occupations. **Table 3** provides some relevant information, based on our own field work (this information should be read bearing in mind a pre-crisis labour force participation rate of

about 25 per cent). Evidently, the typical mid-1990 family food basket is now out of reach of most Iraqi households.

3.3 THE AGRICULTURAL SECTOR The agricultural sector is best placed to maintain real incomes in the face of price increases of imported food items. In fact, if we take food as “numeraire”, and remember that non-food agricultural production is not very important in Iraq, we can say that real incomes in agriculture are roughly proportional to the level of output.

According to Iraqi officials, and also to the Food and Agriculture Organisation’s contribution to the Aga Khan report, agricultural output in 1991 was only 25 to 30 per cent of the previous year’s bumper crop despite a reported 50 per cent increase in cultivated area. A number of reasons have been cited for this drastic reduction. The main ones are said to be the failure of rains in the north and the breakdown of the electric-powered irrigation system in the central and southern regions. Other problems that have been referred to include shortages of inputs such as fertilisers, pesticides, seeds, and spare parts for agricultural machinery. There were, of course, important inter-regional variations in the quality of the harvest, even over short distances, with some areas enjoying unusually good crops while others suffered heavy losses.

An important qualification to the notion that real agricultural incomes are roughly proportional to output arises from the existence of forced government procurement at relatively low prices. On this question, the official position has been that there was no forced procurement, and that the government procurement prices were high enough, in any case, to make the issue of quantity constraints irrelevant. In 1991, the procurement price of wheat was raised from 400 dinars a tonne to 800 dinars, and for barley it increased from around 250 dinars to 500 dinars a tonne. Even this doubling, however, may not have been enough to induce voluntary sales. In fact we found that many farmers had been obliged to sell up to half their harvests at prices they considered to be low. Taking this into account, the decline of real agricultural incomes in 1991 was probably a little larger than the decline in output.

Something should also be said about livestock-rearing, which has always been an important activity in Iraq. Recent changes in real incomes for this sub-sector are not easy to assess. On the negative side, there have been reports of widespread disease among cattle and sheep as a result of the failure of veterinary services during the war, and of acute shortages of vaccines and other supplies. Livestock owners have also experienced difficulties in obtaining fodder due to the high prices of cereals. In some areas, households reported that forced procurement of grain by the government left them with no choice but to sell some of their livestock. The failure of rains in many areas compounded the problem of high fodder prices as there was less grazing available.

On balance, however, livestock rearers did better than other agriculturalists through a combination of increased sales (largely substituting for earlier imports) and higher prices. We also heard some reports of herds being exported (or smuggled) out of Iraq to neighbouring countries where the prices are higher still.

Those grain producers who had good harvests benefited from the high market prices, but they represent a relatively small proportion of agricultural households. Instead of marketing their surpluses, most of these households preferred to increase their own stocks as an insurance against hunger. Livestock rearers were also less badly hit than the majority. Due to a poor harvest, however, the economic situation for a large number of rural households was not very different from that of households dependent upon non-agricultural activities.

3.4 THE INDUSTRIAL SECTOR The industrial sector, which employed around 7 per cent of the workforce at the time of the 1987 census, has perhaps been the sector most seriously affected by the recent crisis. Many large industries suffered direct damage as a result of bombing during the crisis.³⁰ Sub-sectors such as petrochemicals, chemicals (including fertilisers and pesticides), cement, glass, etc., were badly damaged. Most of these belonged to the public sector. During the crisis and in the period immediately following, there was a near total shutdown even of those units that had not incurred any physical war damage. This was due to the disruption of infrastructural facilities such as power generation, water supply and transport.

As basic power, water and transport systems are being restored a number of the industrial units have restarted. However, activity remains seriously curtailed as a result of the shortage of imported raw materials and spare parts.³¹ Iraq has little if any industrial base for the domestic production of capital goods. All machinery is imported, as are most spare parts. The imposition of sanctions has led to a steady deterioration of capacity as stocks of spare parts have been used up. Many of the consumer industries are geared towards the processing and packaging of imported raw materials. These too have been severely affected.

It is sometimes assumed that the cutting edge of sanctions lies in formal prohibitions against imports. In fact the main problem most importers face today is the shortage of hard currency. The government used to make foreign exchange selectively available at the official rates to the public and private sectors through the issue of import licenses. Now that the government has been deprived of its ability to sell oil and earn foreign exchange, it has suspended import licenses, making it impossible for Iraqi firms to import even if they are able to find a trading partner abroad.³²

In a number of the industrial units we visited, activity was reduced to the level of carrying out repairs and preparations for the eventual resumption of production. Plant managers were not certain as to when they would be able to restart production, as this depended upon the availability of imports. Most units claimed their imports were frozen since the sanctions.

The public sector has followed a policy of maintaining its workforce in spite of stoppages and slow-downs. Workers continue to receive their basic salaries even if there is no work. They simply have to present themselves at the factory once a day in order to be entitled to their salaries. Money wage levels have remained unchanged since the beginning of sanctions, although increments of the order of 30 percent throughout the public sector were announced early September.

Private sector firms, on the other hand, have laid off many production workers as a result of recession. Wages have risen only slightly, and mainly for highly skilled and qualified employees. Some among the larger firms have increased their use of casual piece-work contract labour. These workers are doing many of the jobs previously undertaken by permanent staff. The wages for this sort of activity are in the range of 15 dinars a day. Work is not always available, and according to our respondents, a casual labourer could expect to work about 15 to 20 days in a month on average. Table 3 presents estimates of current wages and earnings in different occupations, based on our own field work. In the absence of reliable secondary data on industrial production and employment in Iraq, it is quite difficult to estimate the precise extent of the current recession (see **Appendix** for case studies). On the basis of a large number of informal enquiries, however, we would venture the suggestion that industrial production has dropped by 50 per cent, at the very least, since August 1990. The decline of industrial employment would have been larger than this figure in the private sector, smaller in the public sector, and overall may well be around 50 per cent too. These figures are indicative, and they are mentioned here only to give the reader a general idea of the extent of excess capacity and unemployment in the industrial sector.

3.5 THE SERVICE AND “INFORMAL” SECTORS As was mentioned earlier, a major part of the service sector workforce actually consists of public-sector employees, including a large proportion of army conscripts. Employment levels in the civil service and “professional” armed services have not changed dramatically. There has been a freeze on recruitment, but so far there have not been any lay-offs. This is not the case with conscripts: since the war, large numbers of soldiers have been demobilised.

Salaries in the government sector have remained near their nominal levels of mid-1990. Top officials and “professional” officers are the exception; they have received high pay rises. Qualified professionals such as doctors have been able to enhance their earnings through private practice. For the vast majority of public service sector employees, however, money incomes have stagnated since August 1990.

It is worth noting that employees in the non-military public sector, as well as officers in the armed services, have access to special “Shopping Centres” run by the Ministry of Trade. These sometimes sell food items not provided by the general rationing system, at subsidised prices. This has the effect of raising the real incomes of this section of the population. If all the officially-listed items were actually supplied on a

regular basis, the real incomes of the recipients might increase by up to 100 dinars a month. In practice, however, supplies are erratic, queues are long, and obtaining one's share depends much on chance. In our household surveys we found many people foregoing their right to visit the shops because they thought it was not worth the bother.

In the private service sector, levels of earnings are related to ownership of assets. Taxi drivers in Baghdad, for example, can expect to earn up to 50 or 60 dinars a day. Shop-keepers with stocks in hand, and some skilled craftsmen with their own workshops have been able to check the decline in their real incomes. There are large and growing numbers entering the service and informal sectors, however, who do not own assets. For these people nominal incomes have stagnated and real earnings have collapsed, as in the case of employees.

The rise in informal sector service employment is indicative of the high level of disguised unemployment and underemployment in Iraq. It is interesting to note that, prior to the crisis, those involved in these activities were mainly immigrant workers. Most daily-wage labourers in areas such as construction were non-Iraqis. Similarly most of the petty trading activities were carried out by foreigners. Iraqis began entering these activities following the departure of these workers at the beginning of the crisis.

Wages of daily unskilled labour have risen somewhat since last year. Our interviews with daily-wage earners suggest that many of them are recently-released soldiers. Those who have always relied on daily-wage labour report a marked decline in employment opportunities as compared to last year (in spite of the departure of foreign workers). Before, they would expect to work every day of the month, but presently the average is around 15 days. Traditionally, one of the biggest employers of daily wage labourers has been the construction sector.³³ Due to acute shortage of raw materials this sector has slowed down considerably.

The number of people involved in informal activities has risen dramatically. The "bottom-line" activity appears to be petty trade. Large numbers of people including women, children and old people are involved in the peddling of various assortments of consumer goods, including vegetables, cigarettes, snacks etc. We even came across a number of people with high educational qualifications and skills who were involved in these activities for the sake of subsistence. In general, respondents expressed a preference for daily labour over petty trade and most would consider the latter only as a last resort. The daily earnings for this activity are very unstable; they average around 5 dinars, or the equivalent of about 2 kg of wheat-flour (the cheapest source of calories). Such low wages are normally found only in the rural areas of the poorest countries in the world.

3.6 TRANSFER PAYMENTS TO "DESTITUTE" HOUSEHOLDS Households without any means of income or support are eligible to be registered as "destitute" with the Ministry of Labour and Social Welfare, and are entitled to cash social security payments. While in theory the system is supposed to provide comprehensive income support, in practice only cases of severe poverty are dealt with. Those on the register are mainly widows, disabled people, and persons who do not get other pensions.³⁴

This section of the population has been particularly vulnerable to recent price increases. Indeed, social security payments have remained constant in money terms since August 1990. Their purchasing power, already rather low to start with (a family of five is entitled to 54 dinars per month), has dropped to negligible levels.³⁵

In addition to those already registered as destitutes, the last year has seen a huge increase in applications from people wanting to be added to the register. In Nineveh Governorate, for instance, around 7,000 households are registered, while another 30,000 are waiting for their applications to be processed. The large rise in the number of households wanting to be registered as destitute is a reflection of the general impoverishment that has resulted from war and sanctions.

3.7 OUTLOOK The findings of the preceding sections broadly lend support to the hypothesis, advanced in Sections 3.1 and 3.2, that real labour earnings in Iraq (as well as real incomes from pensions and related state transfers) have declined since August 1990 pro rata the increase of consumer prices. Before moving on, it may be worth commenting briefly on prospects for the near future.

As was discussed in Section 3.2, food prices seem to have reached a somewhat stable equilibrium. For the main imported food staples, such as wheat-flour, prices are now close to the levels that prevail in Jordan. They cannot decline further as long as the value of the dinar remains at its present level. They may rise if the currency depreciates further.

The agricultural sector stands reasonable chances of some economic recovery in the near future. However, there is a serious danger of poor harvests next year if imported seeds, fertilisers, pesticides and spare parts for farm machinery are not available to farmers at affordable prices. Livestock production for next year will be affected by the depletion of herds beyond levels required for the maintenance of stable stock due to excessive selling and slaughtering this year.

In the private industrial sector, the current trend towards laying off workers, operating shorter shifts and - ultimately - declaring bankruptcy will be hard to reverse. War-related damage, including the disruption of water and power supplies, and bottlenecks directly related to sanctions, especially the shortage of raw materials and spare parts, alternately act as the binding constraint on production. There is little prospect of serious improvement until the sanctions are significantly eased. In the meantime, employment and real wages will almost certainly continue to decline.

Public-sector wages and state benefits have remained fixed at their nominal mid-1990 levels. Public-sector employment has not increased in civilian activities, and it has dropped significantly in the case of military service. The policy of retaining the workforce and maintaining money wages cannot be sustained indefinitely in the absence of economic activity or other sources of government revenue (e.g. oil sales), without exacerbating inflationary pressures.³⁶ Similarly, infrastructural activities such as construction cannot be resumed to any significant extent in the absence of public resources and raw materials.

In the absence of comprehensive social security provisions for the unemployed, the informal sector has absorbed most of the unemployed and under-employed. The number of people involved in "bottom-line" activities such as petty street vending has increased dramatically. In the absence of employment expansion elsewhere, the pressure on the informal sector is likely to increase. Unfortunately, informal-sector activities are largely non-productive and redistributive, and it is difficult to predict how far they can sustain private incomes.

The Iraqi economy is gradually adjusting to a new equilibrium of prices, production and employment. In this new equilibrium, production and incomes are much below the pre-sanctions levels. The full extent of this decline is apparent if we think of this new equilibrium as one corresponding to a situation where the country has no oil resources.

The foregoing analysis has attempted to shed some light on how private incomes have been affected by the war and sanctions. The role played by oil revenues and state intermediation is critical to the regeneration of private incomes in Iraq. The outlook for the economy remains bleak, and the ability of households to acquire food through the market is correspondingly threatened. In the next section we examine the other important source of food acquisition, the public distribution system, before summing up the implications of recent economic changes for nutritional well-being and other basic needs.

4 THE PUBLIC DISTRIBUTION SYSTEM This section discusses the functioning of Iraq's public distribution system, and its contribution to the basic needs of the population. We shall concentrate primarily on the distribution of food, partly because of the importance attached to nutritional issues throughout this report, and partly because food accounts for the lion's share of commodities delivered through the public distribution system.³⁷ The analysis is partly based on a "food consumption survey" involving detailed interviews with 58 households dispersed throughout the country (this survey is further discussed in Section 5.3).

Our main findings are that Iraq's public distribution system is remarkably comprehensive, equitable, efficient and reliable. The suspicions and criticisms it has attracted in public debates are not well-founded.

These findings, in fact, will not seem terribly surprising to those acquainted with the recent history of public provisioning in Iraq. Indeed, the Government of Iraq has a long record of active involvement in health care, education, food distribution, social security and related fields. Notable achievements in these fields include free public health care for all, free education at all levels, food distribution at highly-subsidised prices, and income support to “destitute” households falling below a pre-specified poverty line. The efficient management of food rationing since August 1990 is a predictable extension of these earlier achievements.³⁸

4.1 ORGANISATIONAL AND ADMINISTRATIVE FEATURES Iraq’s rationing system, in its present form, was introduced in August 1990 - a few weeks after the inception of sanctions.³⁹ The crucial actors of this system are (1) the government, (2) the consumers, and (3) the private “agents” who act as retail sellers on behalf of the government.

The role of the government is to store adequate amounts of food, either imported from abroad or procured within the country, distribute “ration cards” to the population, and supply the agents. Food is supplied to the agents every month according to the number of “coupons” which they are able to produce. These coupons are collected by the agents from their customers, who detach them from the ration cards.

The agents, most of whom are ordinary grocers with a small clientele, collect coupons every month from their customers, pass them to the government in exchange for food supplies, and then supply the food to the customers. They charge the official ration prices and collect a commission of 10 per cent on sales (the remainder of the proceeds belong to the government). In August 1991, there were, according to the Ministry of Trade, 48,023 agents serving local customers throughout the country.

The task of consumers is simply to present themselves every month at the local ration shop with their ration card, give the required coupons to the agent (one for each commodity), pay for their ration and take it home.

A few other features of the system deserve immediate mention. First, every resident household in Iraq is entitled to a ration card. The rations are identical for everyone throughout the country, irrespective of age, sex, region, nationality or any other criterion.⁴⁰ The prices charged for the rations, which are fixed by the government, are also uniform.

Second, it is not so easy for agents to cheat their customers. They cannot claim food supplies from the government unless they can present coupons, and cannot obtain coupons from the customers unless they give them a satisfactory deal. Since prices and rations are uniform throughout the country, households tend to be well-informed about their entitlements, and complaints are severely dealt with.

Third, the customers themselves also have a strong interest in participating vigilantly in the system. Indeed, as will be shown shortly, food rations are a virtually indispensable means of sustenance for a majority of Iraqi households.

In conclusion, it is worth noting that Iraq’s food distribution system relies on an effective combination of public initiative and private activity. The strong arm of the state allied with the invisible hand of private incentives succeed in averting both the inequities of market exchange and the inefficiencies of bureaucratic control.

4.2 SIZE AND IMPLICIT VALUE OF RATIONS What do food rations represent for the recipient households? A common way of approaching this question is to compare the quantities distributed with overall nutritional needs. In Iraq, public distribution accounts for quite a large share of food consumption (see **Table 4**). For instance, rations of wheat-flour, the main staple foodgrain, represent about a half of average pre-crisis consumption. Considering all food items together, individual food rations provide about 1,400 calories per day, or a little less than one half of average pre-crisis calorie intake.⁴¹

Since rations are not distributed free of charge, however, a more economically meaningful measure of the implicit value of food rations can be obtained by subtracting their value at official prices from their value at

market prices.⁴² The relevant calculations appear in **Table 4**. From this angle, too, we find that food distribution represents a major addition to the purchasing power of Iraqi households. Comparing **Tables 3 and 4**, it can be seen that monthly income-in-kind from food rations for a household of size 6 (208 dinars) is considerably larger than the monthly salary of, say, a soldier or unskilled worker. The role of Iraq's public distribution system in protecting the most vulnerable households from destitution is evidently crucial.

4.3 COVERAGE AND EQUITY — As was mentioned earlier, all households in Iraq are entitled to equal per-capita food rations. This principle is undisputed, but how it applies in practice is a different matter.

Addressing this issue was one of the principal aims of our field work. In the course of this work, we interviewed as many households as possible throughout the country (the formal consumption survey alone covered 58 households), making it a point to visit remote villages, impoverished neighbourhoods, displaced households, ethnic minorities and areas where tensions between the local population and the government were known to be rife. Not only did we fail to find a single household without a ration card, we also failed to find a single person who knew a household without a ration card.

An important exception needs to be made, however, for Kurdish areas outside government control.⁴³ In these areas, the government simply does not have the authority required to administer a public distribution system. At the moment, food distribution in these areas is carried out on an ad hoc basis by UN agencies, often in cooperation or consultation with peshmerga relief organisations. The transition from these temporary provisions to a system that is compatible with sustainable administrative arrangements for this territory requires close attention. This is especially so in view of the intensity of humanitarian needs in these areas, and of the possible departure of UN agencies at the end of the year. However, this particular problem is already the object of a great deal of expert scrutiny, and in this general report we can do little more than mention it and stress its importance.

Closely related to the question of coverage is that of equity between different sections of the population distinguished by residence, occupation, ethnicity, ideology or similar criteria. A good test, in this respect, would be to check whether everyone receives the same quantity of wheat-flour, the main component of food rations, or whether some receive more than others.⁴⁴ As Table 5 indicates, out of 41 households for which we have information on this, 36 reported receiving the official rations of 8 kg per person per month. Four households reported slightly smaller rations (between 6 and 8 kg); one household reported receiving larger rations (about 9 kg).⁴⁵ Thus, all our respondents did receive food rations that are very close, in most cases, equal, to the official norm.

This is not to say that irregularities of distribution are completely absent. We cannot exclude, for instance, some regional discrimination based on the quality of food distributed. And it would be surprising if private agents invariably gave their customers their exact due and charged them the exact price. In fact, a number of respondents mentioned the possibility of some petty cheating and admitted that they did not always check the weight of each item in their rations. However, we could not find any evidence of systematic discrimination against particular sections of the population on a significant scale.

It may seem surprising that a regime as repressive and intolerant as that of Saddam Hussein should turn out to be so considerate and impartial in matters of food distribution. There is, however, nothing new in this observation. Authoritarian rulers over the world, from Pinochet in Chile to Ershad in Bangladesh and including al-Sabah family in Kuwait, have not hesitated to utilise food hand-outs as a way of defusing tensions and containing dissent. Nor has the potential of food as a political weapon been lost sight of by either side in the Gulf crisis.

4.4 EFFICIENCY AND RELIABILITY — Our food consumption survey included questions about the perceptions of respondents regarding the functioning of the public distribution system. These questions, and the discussions that surrounded them, gave us an opportunity to probe into a number of possible shortcomings of the system, including delivery failures, delays, queues, red tape, deficient food quality and corruption.

A very positive aspect of the public distribution system is that delivery failures (in the sense of a discontinuation of food rationing in a particular locality in a particular month) appear to be extremely rare. As **Table 5** indicates, only one of the 58 respondent households stated that it had ever failed to obtain monthly food rations after the period corresponding to the war and the internal conflicts that followed. During the latter period, delivery failures did occur quite frequently, chiefly due to the collapse of transport and communications (in some cases, but not all, losing households were compensated for these delivery failures the following month). For all months following this troubled period, 57 out of 58 households report regular deliveries.

A related question is that of delays. In this respect, the record is not completely unblemished. Occasional delays in delivery were reported by 50 per cent of the respondents (see **Table 5**). However, the length of these delays rarely exceeded a few days.

Queues were reported to be rare. Most households emphasised that there was no need to queue, or that queues were quite short, as they were entitled to collect their rations from the local agent at any time. Some respondents pointed out that the absence of queues depends critically on the efficiency of the local agent. Many agents prepare parcels for their customers, containing the whole bundle of rationed items in the prescribed quantities, and hand these parcels to the recipients whenever they visit the shop.

Few allegations of corruption came up in the course of our survey. A number of households stated that an unscrupulous agent can always manage some cheating on the quantities. There is also some evidence that the prices charged by agents are slightly higher than the official prices (see **Table 5**).⁴⁶ However, the sums involved are quite tiny as a proportion of the total value of food rations. Harsh penalties seem to provide effective deterrents against the more serious forms of corruption.⁴⁷

When they were asked to state what they perceived as the shortcomings of the public distribution system, and the scope for improvements, most of our respondents had remarkably little to say.⁴⁸ The answers reflected general satisfaction with the system, and an appreciation of its relatively efficient functioning. The only complaint we frequently heard related to the poor quality of the food distributed (e.g. wheat flour that needs to be mixed with higher-quality flour purchased on the market in order to make decent bread). Aside from this, there was a general demand for larger rations, as existing rations were deemed insufficient to meet food needs while market purchases were prohibitively expensive.

To conclude, the subjective assessments of households provided further indications of the high standards of public distribution in Iraq.

4.5 Public Distribution and the Army It is sometimes asserted that the army is the chief beneficiary of food distribution in Iraq, and that supporting the public distribution system would amount to supporting the armed forces. On this question, a few observations are due.

There may well be some truth in the notion that soldiers and their families get a somewhat disproportionate share of government-provided food. This happens in two ways. First, families with a member in the army can continue to claim food rations from the public distribution system in the name of this member, even though he is also fed directly by the army. In other words, these families get somewhat higher food rations per resident member than other families.

This bias, however, may or may not be a seriously objectionable one. While it does appear to introduce an element of inequity in the system, families with members in the armed forces may well deserve some special support, in so far as they experience some important economic and social handicaps (e.g. as female-headed households with high dependency ratios).⁴⁹ The issue may not be a momentous one, given the relatively small size of the inequalities involved.

Second, interviews with demobilised members of the armed forces suggest that, aside from receiving their modest monthly pay, soldiers are allowed to eat as much as they like (this is not surprising, since hungry soldiers can hardly make a strong army). In this respect, soldiers certainly enjoy individual privileges. But

this is not all bad news from the point of view of international food aid policy. Indeed, the very fact that the Iraqi army is, in all likelihood, already well-fed also implies that any additional food aid channelled through the public distribution system would be consumed almost entirely by the civilian Iraqi population. Here again, the danger that the Iraqi army might be eating up food sent through international efforts to help hungry children seems to have been much over-rated.

The possibility remains that influential military or political leaders succeed in appropriating food aid or food imports intended for the public distribution system (presumably to sell them at a high price on the open market). However, "leakages" of this kind are relatively easy to detect, by maintaining precise accounts of the aggregate quantities of food that are absorbed in the system, and comparing these quantities with survey information on the rations actually obtained by Iraqi households. A strong case can be made for improved monitoring, but not for dispensing with the system altogether.

4.6 Concluding Comments Iraq's public distribution system is quite an exemplary one in terms of coverage, equity, efficiency, and contribution to the nutritional needs of the population.⁵⁰ Whatever the motives that underlie its long-standing commitment to the provision of cheap food, the government of Iraq is very unlikely to take the risk of withdrawing or even reducing food rationing in the near future (unless it runs out of resources); at a time of much-eroded public support for the regime, the political value of this widely-appreciated programme is greater than ever.

This means that Iraq's public distribution system is an asset that can and should be reckoned with in the planning of humanitarian assistance. It is not a perfect system, but its weaknesses are easy to monitor and correct, and despite some imperfections it can achieve enormously more than any hastily-built system of alternative distribution under international auspices. The crucially-needed contribution of the international community is not to feed the Iraqi population directly, or even to act as a watchdog of the government's efforts, but to ensure that the government has the means to sustain even expand its own public distribution system. This, surely, is the most viable way of relieving nutritional deprivation in Iraq.

5 HUNGER AND POVERTY IN IRAQ The ability of households to satisfy their basic needs depends on what they can acquire both through private purchases and through public provisioning. In the case of nutritional needs, the relevant commodities would include not only food but also health care, clean water, epidemiological protection, etc. Indeed, the nutritional status of a person is not just a question of food, but also of these complementary inputs enabling him or her to achieve the efficient transformation of food intake into physical well-being. For instance, contaminated water can cause diarrhoea, which substantially increases a person's vulnerability to undernutrition even without any change in food intake.

The Gulf Crisis in Iraq has threatened both private and public channels of acquisition for a whole range of nutrition-related commodities, leading to greatly enhanced levels of undernutrition. In this section, we examine this process with reference to food itself. This is partly because food is the most basic ingredient of adequate nutrition, and partly because other ingredients (especially health care and related public services) are dealt with in great detail in other contributions to the International Study Team report.

5.1 WAR AND FAMINE During the crisis, both private and public channels of food acquisition were comprehensively disrupted. As a result, a large majority of the population went hungry.⁵¹

As far as market acquisition is concerned, one consideration is that economic activity came to a virtual standstill during the war as fuel, transport, communications, power, raw materials and spare parts were found wanting. Deprived of their ordinary sources of income, households could only buy food from their savings, or by selling their assets (this they did on a massive scale). At the same time, however, exorbitant food prices greatly restricted the scope and viability of such transactions. As the continued bombing of roads (including that linking Baghdad with Amman) made transport and trade highly perilous activities, local shortages quickly developed, and food prices reached extremely high levels, with wide disparities emerging between different regions (see Section 3.2).

The situation was considerably aggravated by the temporary disruption of the rationing system. With the breakdown of normal channels of transport, communication and administration, food distribution failed in

many areas (including, at times, Baghdad).⁵²

These “entitlement failures” led to widespread hunger. Very few of the households we interviewed reported eating normally during the war. Food deprivation ranged from eating a single daily meal of dates and tomatoes, or of barley and wild spinach, to giving up meat and other “superior” foods. Our survey of 58 households dispersed through the country strongly suggests that the average Iraqi household had a highly inadequate diet during the war (see Section 5.3).⁵³

The same survey clearly brings out that most of the “indicators” that are now recognised in the economic literature as being commonly associated with famine situations were discernible in Iraq during the war: drastic reduction of food intake; exorbitant food prices; consumption of wild plants and other “famine foods”; large-scale depletion of household assets; and even the emergence of open conflicts between family members (sometimes leading to physical fights) over the allocation of food. The only related indicator of which we have no evidence is mass migration in search of food. However, most households could not have expected to gain much from migrating, since no public relief was available anywhere. Their best bet was to remain in place and hope for a prompt resumption of public distribution through normal channels.

Mortality data provide further indications of the intensity of food deprivation during the crisis. The International Study Team’s mortality survey, which covered about 9,000 households, indicates that infant mortality rates for the period January–August 1991 were three to four times as high as for the same period in 1990.⁵⁴ Month-wise mortality rates are not available, but it is likely that mortality rates were particularly high during the war. Indeed, most of the respondents of our survey stated that the crisis and, in some areas, the internal conflicts that followed, had been the period of greatest hardship in the last twelve months (see **Section 5.3**).

This is not to say that these excess infant deaths occurred mainly as a direct result of bombings. In fact, civilian casualties from bombings were reported to be very low in all the areas we visited. Most of the babies who lost their life during the war period must have died from diseases related to poor nutrition, lack of clean water and related deprivations.

It is, in sum, not an exaggeration to say that famine conditions prevailed during the crisis.⁵⁵ People did not migrate en masse, or die of starvation on the side of the road, as one often witnesses in more spectacular famines. But millions experienced the quiet pangs of hunger inside their homes, and food deprivation contributed to the sharp increase of mortality.

The links between war and famine are familiar to students of the grisly history of hunger in the world. Most famines in the recent past have been associated with war, and few wars have failed to threaten the ability of the affected populations to feed themselves. The Gulf Crisis was no exception.

5.2 Recent Development The period that immediately followed the crisis witnessed some easing of the constraints that had made food acquisition so problematic during the crisis itself. Some wage employment opportunities re-emerged, even though they remained much below pre-crisis levels. Food prices climbed down from their wartime peak, though they stayed much higher than the corresponding mid-1990 prices. And, most importantly, the public distribution of food quickly resumed.

This momentary improvement, however, did not lead to a process of sustained economic recovery. In fact, it is far from clear that the economic situation in Iraq has significantly improved in recent months. Food prices have not changed very much since April, when food sanctions were lifted (see Section 3.2). Lay-offs in the private sector have continued (as the prospect of continued sanctions made it increasingly costly to “hoard” labour), while public-sector employment has stagnated. Money wages have remained fairly constant (although increases of the order of 30 per cent in the public sector were announced in early September). Increasing competition has also kept the lid on individual earnings in the “informal sector”. Some expansion of public distribution has taken place, but not on the scale required to compensate for these adverse trends.

Living conditions in Iraq therefore remain extremely precarious. Although the threat of famine has

subsidised (and is not likely to re-emerge as long as the public distribution system functions), poverty and nutritional deprivation persist on an endemic scale. Telling indications of the extent of poverty and hunger in Iraq today can be obtained by considering the current levels of real wages and incomes. **Tables 6a and 6b** present some relevant data, and some tentative comparisons of labour earnings with various benchmarks. These calculations suggest that real monthly earnings for unskilled labour as well as in most other occupations are:⁵⁶

- (1) less than 7 per cent of what they were in August 1990;
- (2) lower than the benchmark used by the Government of Iraq before August 1990 to identify “destitute households” eligible for social security payments;
- (3) much lower than the cost of purchasing the average 1990 food basket for Iraq;
- (4) lower than the monthly earnings of unskilled agricultural labourers in India (one of the poorest countries in the world);
- (5) lower than the “poverty line” used by the Government of India (calculated for Iraq in terms of calorie-purchasing-power equivalence at current prices).⁵⁷

If, instead of considering monthly earnings in the usual sense, we consider “effective” monthly earnings, in the sense of earnings inclusive of the implicit value of food rations, these conclusions remain broadly applicable (although the observed decline of earnings is somewhat less pronounced in that case).

The individual calculations presented in **Tables 6a and 6b** are, inevitably, somewhat tentative, and in the absence of reliable information on the occupational distribution of the population they do not enable us to determine precisely how many households in Iraq fall under particular income thresholds. However, the overall picture of endemic poverty that emerges is certainly quite robust, and some broad inferences can be made with some confidence. For instance, these tables very strongly suggest that, in terms of current income, a majority of Iraqi households are now below the Indian “poverty line”. This is quite striking, especially if one remembers that the corresponding proportion in India itself is now well below 50 per cent.

As will be seen shortly, these drastically reduced incomes have two consequences. First, consumption standards have greatly deteriorated in 1991. Many households now spend virtually all their income on food, and even then they cannot afford diets comparable to those they enjoyed before August 1990. Second, households have to sell their assets (jewelry, furniture, consumer durables, etc.) in order to maintain minimum consumption standards.⁵⁸

The fact that many poor households in Iraq do own assets, which they can sell in order to buy food, is superficially comforting, to the extent that it enables them to spend a little more than what they earn in the short run. But it also means that they are vulnerable to running out of assets to sell. In the course of our survey, we encountered many households who reported having reached that stage. The same respondents often stated that, for them, things had got worse rather than better in the last few months. There is a serious danger that more and more households will face this predicament during the next few months.

As assets gradually run out, it will become more and more difficult for Iraqi households to “live above their means” (i.e. to maintain consumption standards that bear little relation to their current incomes). Correspondingly, well-being indicators are likely to deteriorate towards levels that reflect much-reduced entitlements. Unless some regeneration of incomes and public provisioning takes place, it is quite possible that a large part of the population in Iraq will soon experience rates of undernutrition, morbidity and mortality comparable to those that prevail in countries such as India.

5.3 INSIGHTS FROM A HOUSEHOLD SURVEY — A survey of 58 households scattered in different parts of Iraq was conducted in late August and early September. The aim of the survey was to gather information on food consumption behaviour during and since the war, as well as on the public distribution system (our findings on the latter subject have already been reported in **Section 4**).

No systematic sampling procedure was followed. Our concern was not with formal statistical inference, and we simply adopted the undemanding method of picking a household at random from time to time, by knocking on the nearest door, in the areas we visited. These areas were characterised by great diversity, as we wished to see the country in all its aspects (affluent neighbourhoods were somewhat neglected, but they account for a small part of the total population). While the sample cannot claim to be representative, it is also unlikely to suffer from some devastating bias.

To the question, what was the most difficult period for the fulfilment of food needs, we received a clear set of responses: 15 respondents said it was during the crisis, 22 mentioned the crisis and the “troubles” (as the post-war internal conflicts were referred to), and another 15 reported that every month since the beginning of the war had been hard, and that things had not improved much. A regional pattern is evident in the first two replies - households in the south overwhelmingly found it difficult from January till March, while those away from the “troubles” had most serious problems in January and February only. What is worth noting is that similar proportions of households in the south and elsewhere stated that hardship continued or was increasing.

It is also significant that, on the whole, the households for which hardship continued beyond March were also the poorer ones to start with (many of them had run out of assets to sell and other reserves). For convenience, we shall refer to these households as “most vulnerable”.

As **Table 7** indicates, only 17 per cent of the sample households consumed any meat during the hardest period. By August 67 per cent had resumed some consumption, but in most cases at very modest levels by pre-crisis standards. Among “most vulnerable” households, only 17 per cent were eating any meat in August 1991.

A majority of the households (58 per cent) skipped meals during their difficult period. Among the remaining households, many reported that they had to prepare three meals a day for the sake of children, but that the size of meals had been much reduced during that period.

Only 14 per cent of sample households maintained their normal dietary patterns during the hard period, while another 8 per cent consumed close to their usual diets. One in ten volunteered the information that they had resorted to some form of “famine food” or other; for the most vulnerable households the ratio was as high as 20 per cent. A common famine food in the south was a spinach-like wild plant called khabaas or tula. People also ate coarser cereals, and one household reported having to extract edible matter from reed stalks. Another one (in the south) mentioned being totally deprived of food for 7 days, during the “troubles” - even the children had nothing to eat for a whole week. During the hard period, the vast majority survived on low-cost diets such as bread and dates, or bread and tea.

During informal discussions with several respondents, we learnt of open quarrels within the family (and even physical fights) over the allocation of food. In one household we were told that when the children cried of hunger, they were simply sent out to look for anything they could find.

Asset sales for the purpose of buying food were also common among our respondents. Among the most vulnerable households, many said that they had run out of assets to sell. A number of them survived almost exclusively from the food rations they obtained from the public distribution system, and had severely restricted their open-market purchases of most food items.

These results broadly confirm the existence of famine conditions during and soon after the war for the majority of households. A number of them have seen some improvement since then. It is a matter of great concern, however, that a substantial number see their conditions as deteriorating, and do not see much prospect for improvement in the near future.

6 OVERVIEW AND DISCUSSION

6.1. Selective overview of findings The following are selected conclusions that have a particularly

important bearing on the current debate about sanctions.

(1) The Iraqi economy is currently paralysed by the lack of raw materials, spare parts, power supply, infrastructural services and government revenue. The shortage of public resources has led to the withdrawal of crucial consumer subsidies and the deterioration of many public services. Agricultural activity and production are well below normal. Excess capacity in industry has resulted in large-scale layoffs. “Disguised unemployment” is widespread in the public sector. The demobilisation of the army has further exacerbated the general problem of mounting unemployment in the industrial and tertiary sectors. A bloated “informal sector”, providing extremely low real earnings, has become the main source of livelihood for millions of persons. The sustainability of this informal sector in the near future is threatened by the general erosion of purchasing power.

(2) As a result of this economic crisis, real wages and private incomes in Iraq have fallen dramatically since August 1990. In terms of purchasing power over food, they have declined by a factor of 15 to 20 on average (i.e. to somewhere between 5 and 7 per cent of their initial levels). The driving force behind this decline has been the increase of prices, combined with the stagnation of employment and money wages. Real wages in Iraq are now among the lowest in the world.

(3) The public distribution system plays an invaluable role in supplementing private incomes; it provides a very effective a “safety net” protecting the vulnerable sections of the population from total destitution.⁵⁹ Public distribution of food in Iraq is comprehensive, equitable, efficient and, as far as we can tell, relatively free from corruption. However, the public distribution system falls far short of guaranteeing minimum nutritional needs. [*While it has succeeded in averting famine, it cannot - on its own - sustain the economic transformation that is required to eliminate hunger in Iraq and achieve a significant reduction in poverty.

(4) The sharp decline of real incomes, inadequately compensated by the expansion of food distribution, has greatly reduced the ability of Iraqi households to nourish themselves adequately and to satisfy their basic needs. Inadequate diets, along with the deterioration of basic public services other than food distribution (e.g. health care, water supply, sewage, and sanitation), have led inter alia to sharp increases in mortality rates. Infant mortality during the January–August 1991 period was three to four times as high as during the corresponding 8-month period in 1990.

(5) Nutritional deprivation was particularly acute during the crisis (and, in some regions, during the period of internal conflicts that followed), when famine conditions prevailed. The comprehensive disruption of transport, communications, power supply and administration paralysed economic activity and employment during that period. Food prices reached their peak, and the public distribution system ceased to function in many areas. As a result, millions of people saw their food intake reduced to unsustainably low levels (e.g. a single daily meal of dates and tomatoes, or of barley and wild grass). Famine conditions would have developed even further had the war not promptly come to an end.

(6) Immediately after the crisis, some improvement did take place, as the public distribution system resumed its normal functioning, food prices declined a little and some employment opportunities re-emerged. However, the continuation of sanctions have prevented this momentary improvement from leading to sustained economic recovery. As a result, the purchasing power of wages remains negligible, and endemic poverty persists. Food deprivation is still widespread, in the form of both insufficient intake (for the poorer sections of the population) and reduced diet quality (for the majority of the population).

(7) Even after taking into account the implicit value of food rations, a majority of households in Iraq now earn real incomes below the Indian “poverty line” (in terms of calorie purchasing-power). They survive largely by dissaving and selling their assets (gold, consumer durables, animals, etc.). There is a serious danger that, if economic recovery fails to take place in the next few months, more and more households will be driven to extreme poverty as their assets run out.

6.2. CONCLUDING COMMENTS It is not our brief to defend a particular position in the current debate on economic sanctions against Iraq.⁶⁰ However, our enquiry would be incomplete if we failed to take note of the implications of our findings for some important aspects of this debate.

Before entering this discussion, one general point deserves emphasis. The “effects of the sanctions” have often been analysed in terms of what these sanctions do to aggregate commodity supplies - how far food supplies, or medical supplies, or the supply of cement fall short of ordinary levels. What really matters, however, is how the sanctions affect the ability of consumers (or producers, in the case of raw materials and intermediate inputs) to acquire the commodities in question. “Effective sanctions” in that sense can be

quite different from what sanctions look like on the basis of supply-centered analysis.

For instance, now that the embargo on food imports has been lifted, it is tempting to assume that there is no need to worry about the food situation in Iraq. Indeed, food seems to be readily available from neighbouring countries (see Section 3.2), and in that sense “food supply” is no longer a problem in Iraq. However, as we saw again and again in this report, nutritional deprivation remains endemic, and may even be increasing. Effective sanctions on food remain, due to the crippling effects of general sanctions on economic activity and employment, despite the formal exemption spelt out in Resolution 687 and the ready availability of food from neighbouring countries.

The notion of effective sanctions is also relevant to the much-discussed issue of smuggling. The extent to which Iraq is able to “evade” the sanctions through covert imports has been the object of a good deal of speculation. From the point of view of the “entitlement” approach followed in this report, however, these speculations are quite irrelevant. Indeed, our findings on the decline of wages and purchasing power implicitly incorporate any easing of economic hardship that might be attributable to smuggling and other covert operations. These findings, incidentally, refute any claims that the effectiveness of sanctions has been undermined by illegal transactions.⁶¹ The Sanctions have been “effective”, even though it may well be true that a considerable amount of smuggling has taken place. With this background, we offer a few concluding remarks on the issue of the future course of economic sanctions.

First, sustaining the public distribution system in Iraq is clearly the key to famine prevention in the short run. If the public distribution system runs out of supplies or breaks down for some other reason, widespread starvation is almost certain to result. The system works well, and it would be senseless to attempt to supplant it with a parallel distribution system administered by the United Nations or other international bodies, as has been suggested from time to time in public debates.⁶² Rather, the crucial need is to ensure that the Government of Iraq has the financial means to sustain (or, even better, expand) the existing system of public distribution.⁶³

At a more general level, the pervasive involvement of the state in different aspects of the economy in Iraq is a fact that cannot be ignored. Whether one looks at food distribution, or employment generation, or prices and wages, or international trade, the government is the crucial actor. The cooperation of the government in the planning and implementation of relief efforts is essential.

Second, it is rather hard to understand why a narrow limit should be imposed on Iraq’s exports of oil, if - as specified in Resolution 706 - the proceeds from oil sales are ear-marked for the provision of essential “humanitarian” needs under close UN supervision. The Government of Iraq has a proven ability, and strong political incentives, to expand public provisioning on a large scale - not only in the domain of food rationing but also in those of health care, education, water supply, sewage, sanitation, and power supply, among others. Allowing this process to take place would not conflict with the current directives and stated aims of the embargo.⁶⁴

Indeed, paragraph 23 of Resolution 687 clearly empowers the Sanctions Committee (alias Security Council) to authorise “exceptions to the prohibition against the import of commodities and products originating in Iraq” when these are “required to assure adequate financial resources on the part of Iraq to carry out the activities under paragraph 20”; these activities refer not only to unrestricted purchases of food and medicines, but also to imports (under the “accelerated no-objection procedure”) of materials and supplies for essential civilian needs as identified in the [Ahtisaari report] and in any further findings of humanitarian need by the committee”. It may be recalled that both the Ahtisaari report of March 1991 and the Aga Khan report of July 1991 (which can surely be included under what Resolution 687 calls “further findings of humanitarian needs by the [Sanctions] committee”) provided lists of materials and supplies for essential civilian needs covering a wide range of commodities. These included food, drugs, vaccines, medical equipment, fertilizers, pesticides, agricultural machinery and spare parts, generators, water treatment equipment, sewage disposal equipment, means of alternative communication, and the inputs required to regenerate essential domestic power supply, fuel production and telecommunications.⁶⁵

It is, therefore, hard to reconcile the stringent limit of US \$1.6 billion on oil exports imposed by Resolution

706 (of which less than US \$1 billion will be actually available for humanitarian purposes) with the stated principles of the embargo. As was discussed in Section 2.2, this limit falls far short of even the most conservative of all the estimates of Iraq's humanitarian needs contained in recent reports submitted to the Secretary-General at the request of the Security Council.

Resolution 706 explicitly mentions that the limit on oil exports is "subject to review concurrently the [Security] Council on the basis of its ongoing assessment of the needs and requirements".⁶⁶ The matter should not be considered closed.

Third, while public provisioning in Iraq can avert famine, epidemics and other confined catastrophes, it cannot - on its own - usher the economic transformation that is required to eliminate hunger and achieve a significant reduction in poverty. As we saw earlier, the value of food rations at their current levels represents only about 20 per cent of the current value of the pre-crisis food basket of the average Iraqi household. Even an expansion of public distribution much beyond what can be realistically expected in the near future would fail to restore normal food intakes, let alone bring real wages and incomes back to their pre-crisis levels (about 15 to 20 times as high as current ones). The elimination of hunger and poverty in Iraq crucially depends on the regeneration of private incomes through economic activity and employment.

At this point, we should remember the pervasive linkages that bind the Iraqi economy with international trade. Imported raw materials and spare parts are crucial inputs in many sectors, from agriculture to most types of manufacturing. The supply of consumer goods, which give money wages their real value, depends overwhelmingly either on the processing of imported products (food, textiles, construction materials, etc.), or on direct imports. Even earnings from domestic labour services in the "informal sector" largely derive from the purchasing power generated in sectors closely linked with international trade. In the absence of international trade, the economy comes to a grinding halt - especially when the effects of sanctions are compounded by war-related destruction.

War and prolonged sanctions have caused such comprehensive damage to the Iraqi economy that it is now impossible to maintain these sanctions in their present form without perpetuating, and perhaps even accentuating, the state of acute poverty in which a large part of the population is now plunged. The debate about sanctions cannot ignore this simple truth.

Perhaps the issue of sanctions goes beyond the simple considerations of this final section. Much would depend, however, on what one regards as the "humanitarian needs" of the people of Iraq. If their essential needs are deemed to consist only of staple food, as with farm animals, then it may be possible to argue that these needs can be met through ad hoc relief measures sustained by a limited exemption from the ban on oil exports (as proposed in Resolution 706), while the general paralysis of the economy continues to deprive millions of their ordinary means of living.⁶⁷ But if the Iraqi people are considered to have an inalienable right to the necessities of life in a broader sense - including not only food but also clean water, health care, shelter, education, clothing, etc. - then it would be hard to reconcile the protection of this right with the continuation of the embargo in its present form. If humanitarian needs are those defined by our basic rights as human beings, they go much beyond what the Iraqi economy can deliver as things stand.

The implementation of the ceasefire resolution, which officially motivates the continuation of sanctions against Iraq, is a serious issue. The safe disposal of Iraq's weapons of mass destruction, demanded by this resolution, is a particularly legitimate concern (as is, indeed, the safe disposal of weapons of mass destruction everywhere). But it would be tragic if this concern unleashed the destructive power of another weapon of mass destruction - the effective withdrawal of food and other necessities from the Iraqi people.

APPENDIX

FOUR CASE STUDIES

A number of industrial units suffered extensive damage during the war and the internal conflicts that followed. Damages directly related to the war have been documented elsewhere in the report of the Harvard Study Team. Our main concern here is to evaluate the problems being faced by factories that were not directly damaged by the war. Although manufacturing is a relatively small employer in Iraq (see Figure 1 in Section 2), it is important because of the crucial linkages that exist between manufacturing and other sectors of the economy. The following four case studies, which are based on visits to several industrial sites, bring out some salient features of the Iraqi economy at the present time.

The four factories covered by these case studies are: (1) a private weaving factory in Kerbala, which produces the “kofiyah” (a traditional scarf for men); (2) a recently-privatised food packaging that processes a variety of fruit and vegetables (also in Kerbala); (3) a textile factory in Kut, which manufactures a range of garments and related products; (4) a recently-privatised brick factory in Ammara. Table A1 describes the main features of these factories and provides some basic information on their current predicament.

The food-packaging factory in Kerbala and the textile factory in Kut were selected for investigation because they were the largest industrial employers in these two cities. The weaving factory in Kerbala interested us as a family business. The brick-making factory was picked at random on the road to Basrah. We had no prior information on production and employment conditions in these factories.

In all four cases, plant and machinery are foreign-made and most spare parts have to be imported. All factories have lost some capacity due to the shortage of spare parts. Imports of spare parts and raw materials were previously regulated by the Ministry of Trade and Industry through the issue of import licenses, and were priced using the official exchange rate. As things stand, most non-food imports are prohibited by the sanctions.

All factories reported a sharp decline in production as a result of the sanctions, but they were not all affected in the same way. The weaving factory and the food-packaging company faced shortages of raw materials, while the textile factory had its capacity drastically reduced as a result of the disruption of its plant renewal plans. The food-packaging factory could import its food raw materials without violating the sanctions, but was unable to do so for want of foreign currency. The brick factory, although constrained by restrictions on the import of essential spare parts, faces fewer limitations than the others, and is most likely to resume production in the near future.

In the following account of production and employment conditions in these four factories, the present tense refers to August 1991, the time of our visit.

1. Weaving factory, Kerbala

This private factory was established in 1953, and is still owned and managed as a family business. The main raw materials used are imported cotton yarn and thread. Since August 1990 (when the sanctions were introduced), no supplies have been received and the factory has been running down stocks. Production has been reduced by half to prolong the period of operation, and stocks are expected to last another four months.

Before the sanctions, three shifts totalling 22 hours a day were operated. Activity has now been reduced to one six-hour shift. There have been no lay-offs, and the decline in the workforce is mainly attributable to voluntary turnover. Wages have not changed since before the sanctions. Unskilled workers receive between 150 and 200 dinars a month, while semi-skilled production workers earn up to 250 dinars. A bonus worth two months' salary that used to be paid out every year has not been paid this year.

Just after the war, the main problem faced was an erratic power supply. A more or less regular supply has now been restored, and the shortage of yarn is the main obstacle to higher production levels. Capacity has

also declined by some 15 to 20 per cent due to the shortage of spare parts.

2. Food-packaging company, Kerbala

This factory was set up in the early 1960s within the public sector. It was part of a larger state enterprise comprising of eight other food processing and packaging factories. All units of the state enterprise were privatised in the last few years. This factory was the largest unit and handed over to the private sector in 1988.

The factory has six lines of production, viz. conserves, canned vegetables, tomato paste, tomato ketchup, date syrup and metal cans (for tomato paste). It used to account for 50 per cent of the country's consumption of tomato paste.

Production has ceased in four of the six lines. The breakdown of power supplies led to total closure during and immediately after the war. Currently, the main problem faced by this factory is the shortage of raw materials. This year, only the date syrup and the metal-can lines have had any output. Even for these lines, production is extremely low, at 20 per cent and 8 per cent of capacity respectively.

While nearly all the fruit and vegetables packaged at the plant are locally grown, other raw materials such as sugar, metal cans, and metal sheets for producing cans, are imported. The line least dependent on foreign raw materials is that of date syrup. The main problem here is the availability of glass jars, which were previously supplied by Glass and Ceramic Works in Ramadi. This glass factory was substantially damaged by bombings during the war. Wages for unskilled workers are between 150 and 200 dinars a month, and have not changed since August 1990. Technicians are paid around 600 dinars a month. The factory is the largest private-sector employer in Kerbala, with a normal workforce of 1,400. During the war, only 150 workers (mainly safety and maintenance staff) were retained. At the moment, 350 workers are employed and work is under way to prepare the lines for eventual resumption of production. Managers are not sure when this might occur.

3. Textile factory, Kut

Established in 1969, this public enterprise produces a wide range of cotton, fabric and woollen clothing. Its products are sold in the Ministry of Trade Shopping Centres, as well as in local markets. There are occasional supply orders from the army. Before the sanctions, the factory was also exporting to Jordan, Germany and Romania.

The enterprise is currently implementing a project for the renewal of (imported) plant; this project was initiated five months prior to the beginning of sanctions. Work on this project stopped midway, as a result of the sanctions, causing serious disruption to production. While the project is aimed at boosting capacity by more than 30 per cent (from 150,000 to 200,000 metres a day), capacity is now only 24,000 metres per day.

The other problem faced by this factory is the abrupt departure of most of its skilled foreign workforce. Local workers, many of them demobilised soldiers, have been hired and trained to replace them. Recruitment is not a problem, as local labour is easily available; however, the newly-hired labourers lack experience and skills.

Raw materials are partly local, and partly imported from the Sudan and the United States. Stocks of cotton and fabrics are adequate for another year. Wool is made available by the government for army supply contracts. Power supply is no longer a problem, as the factory is served by a special line.

This factory is the only major industrial concern in Kut, employing some 2,800 (compared with 3,500 last year), of whom 2,000 are production workers. The decline is due to the departure of foreign workers. Wages have remained unchanged since last year, and the starting salary for a production worker is 130 dinars a month.

4. Brick-making factory, Ammara

This factory was established in 1978 in the public sector, and was privatised in 1990. Production capacity is 60 million bricks a year. The output is sold in the governorate of Maysan and the surrounding areas.

Production stopped at the beginning of the war, due to the failure of power supply. Power was not restored until July 1991. The factory has also experienced problems with the delivery of fuel oil, which is used for firing the furnaces. The factory used to work three shifts: two for production and one for firing the furnaces. Stopping a furnace takes four to five days of gradual cooling. According to the management, the sudden shut-down during the war caused damage to the furnaces.

Obtaining imported spare parts poses another problem. We witnessed attempts to restore damaged electrical circuits, which under ordinary circumstances would simply be replaced. As power supply is being resumed, work has begun to refurbish the factory for operation. The shortage of spare parts might well become the next binding constraint.

The factory normally employs 250 workers. Only 40 employees have been retained, mostly maintenance staff. The managers are hopeful of reaching at least 20 per cent of normal capacity within the next six weeks.

List of References

- Anon (1991): "Living on Less", Middle East Business Weekly, 21 June, 1991.
- Anon (1991): "Master of his Universe", The Economist, 20 July.
- Bhatia, B., Kavar, M., and Shahin, M. (1991): "Impact of War and Sanctions on the Women of Iraq", draft contribution to the Harvard Study Team report.
- Bloem, M.W., Farooq, S., and Kuttab, A. (1991): "Vitamin A Deficiency and Malnutrition in Southern Iraq", mimeo, UNICEF.
- Cainkar, Louise (1991a): "The Dying has Just Begun", Reader, 10 May.
- Cainkar, Louise (1991b): "Desert Sin: A Post-war Journey Through Iraq", forthcoming in Moushabeck, M., and Bennis, P. (eds), Beyond the Storm: A Gulf Crisis Reader (New York: Olive Branch Press).
- Dammers, Chris (1991): "Iraq: A Disasters for the 90s?", mimeo (forthcoming in Disasters).
- Dobson, Caroline (1991): "Report on a Visit to Al-Thawra, Baghdad (Saddam City)", mimeo, Gulf Peace Team.
- Doheny, Kevin (1991): "Three and a Half Million Children at Risk in Iraq", mimeo, International Refugee Year Trust, Amman.
- Doheny, Kevin (1991b): "Reporting from Baghdad", mimeo, International Refugee Year Trust, Amman.
- Drèze, J.P., and Sen, A.K. (1989): Hunger and Public Action (Oxford: Oxford University Press).
- Drèze, J.P., and Sen, A.K. (eds) (1990): The Political Economy of Hunger, 3 volumes (Oxford: Oxford University Press).
- Drèze, J.P. (1991): "Political Economy of the Impending Iraqi Famine", mimeo, Development Economics Research Programme, London School of Economics.
- Economist Intelligence Unit (1990): Iraq: Country Profile 1990.
- Farouk-Sluglett, M. (1990): Iraq Since 1958.
- Food and Agriculture Organisation (1991a): FAO Trade Yearbook (Rome: FAO).
- Food and Agriculture Organisation (1991b): FAO Production Yearbook (Rome: FAO).
- Gottstein, U. (1991): "Report on Iraq Trip by German IPPNW Affiliate", mimeo.
- Government of Iraq (various years): Annual Abstract of Statistics (Baghdad: Central Statistical Organisation).
- Grace, Anne (1991): "The Starvation of a Nation: The Myth and Reality of Sanctions", mimeo, Society of Friends.
- Greenpeace (1991): "On Impact: Modern Warfare and the Environment: A Case Study of the Gulf War", mimeo, Greenpeace.
- Gulf Peace Team (1991a): "Gulf Peace Team Special Mission to Iraq: Health Assessment Team", by Eric

- Hoskins, Calvin Baumann and Scott Harding; mimeo, Gulf Peace Team, London.
- Gulf Peace Team (1991b): internal reports.
- Hansen, C.M. (1991): "Kurdish Refugees in Northern Iraq: Some Personal Observations", mimeo.
- Harvard Study Team (May 1991): "Harvard Study Team Report: Public Health in Iraq after the Gulf War", mimeo, Harvard University.
- Hoskins, Eric (1991a): "Starved to Death", New Statesman and Society, 31 May.
- Hoskins, Eric (1991b): "When Push Comes to Shove", mimeo, Gulf Peace Team, London.
- Hussain, H.M. (1990): "Iraq's Agricultural Land Use Program", in Salman, A. (ed), Agriculture in the Middle East (New York: Paragon).
- Initiative Frieden am Golf (1991): internal reports.
- Kandela, P. (1991): "Bomb Now, Die Later", report on Physicians for Human Rights survey, The Lancet, 20 April.
- Lee, I., and Haines, A. (1991): "Health Costs of the Gulf War", British Medical Journal, 3 August.
- Mansfield, Peter (1982): "Saddam Husain's Political Thinking: The Comparison with Nasser", in Niblock (ed), Iraq: The Contemporary State.
- Medical Education Trust (1991): "MET Report: Counting the Human Costs of the Gulf War", mimeo, Medical Education Trust, London.
- Médecins Sans Frontières (1991): internal reports.
- Niblock, Tim (ed) (1982): Iraq: The Contemporary State (London: Croom Helm).
- Ockerman, H.W., and Samano, S.G. (1985): "The Agricultural Development of Iraq", in Beaumont, P., and McLachlan, K. (eds), Agricultural Development in the Middle East (London: John Wiley and Sons).
- OXFAM/Save the Children Fund (1991): "Assessment of Conditions Affecting the Civilian Population of Iraq", mimeo, OXFAM/Save the Children Fund, Oxford and London.
- Pinstrup-Andersen, Per (1988): Consumer-Oriented Food Subsidies: Costs, Benefits and Policy Options for Developing Countries (Baltimore: Johns Hopkins).
- Rice, John (1991): "Iraqis Suffer under Sanctions, Face Worse Times Ahead", Jordan Times, 22 June.
- Sakr, Naomi (1982): "Economic Relations between Iraq and Other Arab Gulf States", in Niblock (ed), Iraq: The Contemporary State.
- Save the Children Fund (1991a): "Iraq: Assessment Team Report", mimeo, Save the Children Fund, London.
- Save the Children Fund (1991b): "Second SCF Assessment Mission to Iraq: 29.4.91 - 9.5.91", mimeo, Save the Children Fund, London.
- Stork, Joe (1982): "State Power and Economic Structure: Class Determination and State Formation in Contemporary Iraq", in Niblock (ed), Iraq: The Contemporary State.

United Nations (1991a): “Report to the Secretary-General on humanitarian needs in Kuwait and Iraq in the immediate post-crisis environment by a mission to the area led by Mr. Martti Ahtisaari, Under-Secretary-General for Administration and Management, dated 20 March 1991”, Document S/22366, United Nations, New York.

United Nations (1991b): “Report to the Secretary-General on Humanitarian Needs in Iraq by a Mission led by Sadruddin Aga Khan, Executive Delegate of the Secretary-General, dated 15 July 1991”, mimeo, Office of the Executive Delegate of the Secretary-General for a United Nations inter-Agency Humanitarian Programme for Iraq, Kuwait and the Iraq/Turkey and Iraq/Iran border areas, Geneva.

United Nations (1991c): “Report by the Secretary-General Pursuant to Paragraph 5 of Security Council Resolution 706 (1991)”, mimeo (4 September), United Nations Office, Geneva.

WHO/UNICEF (1991): “A Visit to Iraq, Feb 16–21 1991”, Joint Team Report, WHO/UNICEF, Geneva.

Zurbrigg, Sheila (1991): “The War’s Over but the Iraqis are Still Dying”, The Globe and Mail, 11 June.

TABLE 1**WORKFORCE IN THE (CIVILIAN) PUBLIC SECTOR, 1990**

GOVERNORATE	Total Number	Per Cent of Workforce
Nineveh	62,909	17.6%
Salah-Al-Din	23,518	13.4%
Ta'meem	35,976	24.7%
Diala	34,544	14.8%
Baghdad City	255,939	27.5%
Anbar	32,532	16.4%
Babylon	38,435	14.3%
Kerbala	18,959	16.7%
Najaf	26,271	18.4%
Qadisiya	24,401	18.0%
Muthanna	13,273	17.4%
Dhi-Qar	30,063	13.5%
Wasit	23,929	17.5%
Maysan	22,806	19.3%
Basrah	86,642	41.0%
Kurdish Autonomous Region		
D'hok	14,910	21.0%
Arbil	38,341	20.5%
Sulaimaniya	43,112	18.7%
ALL IRAQ	826,560	20.9%

Source: Annual Statistical Abstract 1990 (Baghdad: Central Statistical Organisation).

TABLE 2a**FOOD PRICE INCREASES IN IRAQ SINCE SANCTIONS BEGAN**

Food Item	Price per unit ¹ (Iraqi dinars)		Percentage increase over 1 year
	Aug 90	Aug 91	
Wheat-flour	0.05	2.42	4,531%
Milk (powdered)	0.75	27.33	3,661%
Bread (per piece)	0.01	0.33	2,857%
Baby milk (tin of 450g)	0.45	10.00	2,222%
Sugar	0.20	4.42	2,208%
Cooking oil	0.48	10.33	2,138%
Rice	0.23	4.08	1,801%
Tea	1.70	23.67	1,392%
Tomato	0.27	1.25	469%
Chick-peas	0.65	2.92	449%
Potatos	0.45	1.92	426%
Eggs (carton of 30)	3.83	12.50	350%
Onions	0.37	1.25	341%
Dates	0.52	1.75	339%
Meat (lamb)	7.00	16.33	233%
Meat (beef)	6.83	16.90	247%
All items² (high case)			2,004%
All items² (low case)			1,546%
Cost (at current prices) of the average 1990 food basket for a family of six ("low case" assumptions)	66.00	1,010.00	1,546%

¹ The commodity unit is 1 kg unless stated otherwise. For each commodity, the stated price is an unweighted average of the prices reported in Mosul (northern Iraq), Baghdad (central Iraq) and Basra (southern Iraq).

² Food price indices are weighted averages of individual commodity prices; the weights are the corresponding shares of total food expenditure in 1990. Incomplete information on 1990 expenditure patterns was supplemented with more detailed information for 1971. The "high case" and "low case" correspond to different assumptions about the evolution of expenditure patterns between these two dates.

Sources: Household and market surveys, August-September 1991; Review of Food Consumption Surveys (Food and Agricultural Organisation, Rome, 1977); unpublished data from the Ministry of Trade, Government of Iraq. August 1990 prices were obtained by recall.

TABLE 2b**FOOD PRICES IN DIFFERENT LOCALITIES, AUGUST 1991**Commodity Price per unit in different localities¹

	Baghdad	Basra	Mosul	Maysan (rural)	Najaf	Kirkuk
Wheat-flour	2.5	2.25	2.5	3	2.75	2.5
Rice	4	3.75	4.5	5	3.5	4.5
Meat (lamb)	15	17	17	12	14	16
Cooking oil	9	12	10	6.5	14	12
Sugar	4.75	4.5	4	5	4.5	4.5
Tea	25	26	20	22	14	25
Tomatos	1.5	1.25	1	2.5	2.25	2
Onions	1.5	1.25	1	2	1.5	2
Potatos	2	1.75	2	2.5	2	2
Eggs	13.5	13	11	14	12	12

¹ The commodity unit is 1 kg, except for eggs; the price of eggs reported in this table applies to a “carton” of 30 eggs.

Source: Household and market surveys, August 1991. The six localities appearing in this table are quite evenly spread through different parts of the country.

TABLE 3**ESTIMATED MONTHLY WAGES BY OCCUPATION, AUGUST 1991**

Occupation	Monthly Wages (dinars)	Index¹
Conscript, starting	85	65
Clerk, government	120	92
Casual street vending ²	120	92
Unskilled worker, public sector	130	100
Medical assistant	130	100
Conscript, experienced	165	127
Unskilled worker, private sector	175	135
Postman	180	138
Daily-wage labour (unskilled) ²	180	138
Primary teacher, public sector	180	138
Civil service official (mid)	200	154
Professional soldier	220	169
Electrician, public sector	225	173
Semi-skilled worker, private	225	173
Skilled technician, private	600	462
Blacksmith ²	625	481
Bus driver, self-employed	1,000	769
Taxi driver, self-employed ²	1,375	1,058
Engineer, private sector	2,000	1,538

¹ Unskilled worker in the public sector = 100.

² Monthly wage figure obtained by combining information on daily wages with estimates of the number of days of employment per month.

Source: Household and factory surveys, August and September 1991.

TABLE 4

COMPOSITION, COST AND IMPLICIT VALUE OF FOOD RATIONS, AUGUST 1991

Commodity	Quantity Supplied¹ (kg)	Ration price (ID)	Market price (ID)	Implicit value (ID)
Wheat-flour	8.00	0.115	2.417	18.416
Rice	1.50	0.325	4.083	5.637
Sugar	1.50	0.225	4.417	6.288
Cooking oil	0.25	0.410	10.333	2.481
Tea	0.05	2.000	23.667	1.083
Baby milk	1.80	0.750	22.222	38.650
Full ration basket for a family of six (one child under 1 year)		11.088	219.263	208.175

¹ Per person per month.

Source: Household survey, August-September 1991; Ministry of Trade, Government of Iraq. Data from these two sources on the composition and cost of food rations are in close agreement.

TABLE 5**SURVEY OF THE PUBLIC DISTRIBUTION SYSTEM: SUMMARY RESULTS**

HOUSEHOLDS' EXPERIENCE OF THE PDS	NUMBER	PROPORTION
(1) Delivery failures:		
No delivery failures since August 1990	38	70%
Failures during the war and civil conflicts ¹	15	28%
Failures at other times	1	2%
(2) Delays in supply:		
No delays	24	50%
Short delays (1 to 7 days)	18	38%
Long delays (8 to 30 days)	5	12%
(3) Queues:		
Queues develop from time to time	7	12%
No queues	50	82%*
(4) Reported size of wheat-flour rations in August 1991:		
8 kg per person (official amount)	36	88%
Less than 8 kg	4	10%
More than 8 kg	1	2%
<u>Sample mean: 7.93 kg</u>		
RATION PRICE OF WHEAT-FLOUR, AUGUST 1991 (ID/kg)	PRICE	STANDARD DEVIATION
Official	0.115	-
Sample mean	0.141	(0.026)
Sample mean, urban	0.139	(0.025)
Sample mean, rural	0.148	(0.028)

¹ Out of these 15 households, 6 reported that they were compensated during the month that followed delivery failure.

Source: Household survey, August-September 1991. Since information was not obtained on each topic from each respondent, the total number of responses for particular topics is usually smaller than the sample size (58).

TABLE 6A**NOMINAL AND “EFFECTIVE” EARNINGS BY OCCUPATION, AUGUST 1991**

<u>Occupation</u>	<u>Monthly earnings (ID) for 6-member households with 2 earning adults</u>	
	<u>Nominal earnings</u>	<u>“Effective” earnings¹</u>
Conscript, starting	170	378
Clerk, government	240	448
Casual street vending	240	448
Unskilled worker, public sector	260	468
Medical assistant	260	468
Conscript, experienced	330	538
Unskilled worker, private sector	350	558
Postman	360	568
Daily-wage labour (unskilled)	360	568
Primary teacher, public sector	360	568
Civil service official (middle ranking)	400	608
Professional soldier	440	648
Electrician, public sector	550	658
Semi-skilled worker, private sector	550	658
Skilled technician, private sector	1,200	1,408
Blacksmith	1,250	1,458
Bus driver, self-employed	2,000	2,208
Taxi driver, self-employed	2,750	2,958
Engineer, private sector	4,000	4,208

¹ Effective earnings are obtained by adding the implicit value of food rations (see Table 4) to nominal earnings.

Source: Estimates based on household and factory surveys, August-September 1991. The assumed labour-force participation rate of 33% is based on the optimistic hypothesis a substantial increase compared to the pre-crisis value of 25%.

TABLE 6b**ESTIMATES OF LABOUR EARNINGS IN IRAQ (AUGUST 1991),
COMPARED WITH VARIOUS BENCHMARKS**

<u>Description of the estimated variable</u>	<u>Estimate</u> ¹ (ID/month)	<u>Index</u>
Nominal monthly earnings, unskilled labour (public sector)	260	100
“Effective” monthly earnings, unskilled labour (public sector)	468	180
Monthly earnings of unskilled labour in India (in calorie-purchasing-power equivalent)	482	185
Value of the Indian poverty line in terms of “calorie-purchasing-power equivalence”	667	257
Value of the “destitution line” which the Government of Iraq used before August 1990 to identify households eligible for social security payments ²	835	321
Value of the average 1990 food basket	1,010	388
Value of <u>pre-crisis</u> real earnings of unskilled labour (public sector) ²	4,022	1,547

¹ All figures are in monthly terms, for a household of size 6 with 2 earning adults.

² The lower estimate of the food price index (see Table 2) has been used as deflator.

Notes: The calculations for India are based on 1987 data for rural Uttar Pradesh (a slightly poorer-than-average state). “Calorie -purchasing-power equivalence” is defined with reference to the local staple (wheat for both Iraq and Uttar Pradesh). The Indian poverty line is defined as the level of income (more precisely, expenditure) at which minimum calorie requirements are satisfied, taking into account observed expenditure patterns.

TABLE 7

**FOOD CONSUMPTION SURVEY: PERCENTAGE OF HOUSEHOLDS
IN DIFFERENT GROUPS WITH PARTICULAR CHARACTERISTICS**

	Households for which Jan-March was the hardest period	Households for which hardship continues to increases	All households
MAIN DIET DURING HARDEST PERIOD			
Famine Foods	6%	20%	10%
Bread, Dates, Tea	21%	27%	23%
Bread, Rice, Vegetables	48%	47%	48%
Near Normal Diet	9%	0%	6%
Normal Diet	15%	7%	13%
WHETHER MISSED MEALS DURING HARDEST PERIOD			
Missed	51%	73%	58%
Did not miss	49%	27%	42%
WHETHER CONSUMING MEAT			
Hardest period	20%	7%	16%
August 1991	79%	17%	63%
ASSET SALES			
No sales reported	40%	0%	31%
Sales to buy food	50%	33%	46%
No assets to sell	10%	67%	23%

Source: Household survey (58 households), August–September 1991.

ENDNOTES:

¹ We personally collected information in 11 of Iraq's 18 Governorates, and visited each of the main regions. We have also made use of information on the other 7 Governorates collected with our guidance by other members of the International Study Team during the same period.

² See Drèze and Sen (1989, 1991), and the literature cited there.

³ No attempt is made in this report to distinguish precisely between the effects of the Gulf Crisis and those of the internal conflicts that followed. While these conflicts may have had deep roots, their outburst was not unconnected with the war itself. Further, the lasting effects of these internal conflicts on the economy were dwarfed by those of the Gulf Crisis and the sanctions. This is not to deny that internal conflicts may well have taken a comparable or even greater toll in terms of direct casualties and immediate human misery.

⁴ This section draws *inter alia* on Ockerman and Samano (1985), Economist Intelligence Unit (1990), Farouk-Sluglett (1990), Food and Agriculture Organisation (1990a, 1990b), Hussain (1990), Government of Iraq (various years), and various contributions in Niblock (1982).

⁵ According to FAO data for 1988, the most important components of these food imports are foodgrains (36%), meat products (16%) and sugar (10%).

⁶ In the course of our extensive contacts with households and individuals in Iraq, we found that a large proportion of them either had a male member in military service, or included someone recently released from service.

⁷ UN Security Council, Resolution 661 (6 August), para 3; italics added.

⁸ UN Security Council, Resolution 666 (13 September, 1990), paras 5 and 6; italics added.

⁹ This figure is based on Food and Agriculture Organisation (1990a, 1990b) data on pre-crisis food consumption in Iraq.

¹⁰ On the effective embargo on medical supplies before and during the war, see Hoskins (1991a, 1991b), and the wide-ranging professional testimonies contained in the documentary *The Other War* (produced for Channel 4 by Tessa Shaw and Christina Pearce). According to Dr. Hoskins, imports of medical supplies between August 1990 and the end of the war were only about 3 per cent of the normal levels.

¹¹ On this, see United Nations (1991a, 1991b) and Harvard Study Team (May 1991), among others.

¹² United Nations (1991a), p.13.

¹³ In fact, a "letter dated 22 March 1991 from the President of the Security Council addressed to the Secretary-General" (Security Council Document S/22400) had already indicated that these recommendations were accepted by the Security Council.

¹⁴ UN Security Council, Resolution 687, para 21.

¹⁵ See, for instance, Bhatia *et al* (1991), Bloem *et al* (1991), Cainkar (1991a, 1991b), Dammers (1991), Dobson (1991), Doheny (1991a, 1991b), Dreze (1991), Gottstein (1991), Grace (1991), Gulf Peace Team (1991a), Harvard Study Team (May 1991), Hoskins (1991a, 1991b), Initiative Frieden am Golf (1991), Kandela (1991), Lee and Haines (1991), Medical Education Trust (1991), Médecins Sans Frontières (1991), OXFAM/Save the Children Fund (1991), Rice (1991), Save the Children Fund (1991a, 1991b), UNICEF (1991), United Nations (1991a, 1991b), Zurbrigg (1991), among others.

¹⁶ United Nations (1991b), p.8.

¹⁷ United Nations (1991b), p.9

¹⁸ UN Security Council, Resolution 706, para 1. The rationale of the 1.6 billion limit is not explained in the resolution.

¹⁹ UN Security Council, Resolution 706, para 5.

²⁰ United Nations (1991c), Annex I, para 22; emphasis added.

²¹ United Nations (1991c), para 42; emphasis added.

²² United Nations (1991c), Annex I, para 15; emphasis added.

²³ For convenience of exposition, we shall speak of earnings in self-employment as "wages". The "employment rate" is defined here in terms of persons, rather than person-days. Correspondingly, "money wages" refer to wages per person, rather than per day of work.

²⁴ For analytical purposes, the army can be considered, at this stage in the argument, as part of the "tertiary sector". The large-scale demobilisation of soldiers since the end of the crisis can be seen as one part of the overall picture of reduced employment in that sector in recent months.

²⁵. Two considerations somewhat qualify this general argument in opposite directions: (1) skilled labourers who have shifted from formal to informal employment may have experienced some decline in money earnings (however, skilled labourers have been relatively successful in retaining their formal-sector jobs); (2) labour force participation rates may have increased a little, as a number of women and children joined the informal sector to supplement household earnings. Note that the departure of many foreign workers from Iraq since August 1990 does not affect the reasoning pursued in this section.

²⁶. This statement applies to the combined real earnings of cultivators and labourers. We have no reliable information on possible changes in the distribution of income between these two groups.

²⁷. It is worth noting that this statement also applies to the recipients of pensions and other social security payments, since these payments have not increased in money terms since August 1990.

²⁸. The findings of these market surveys are in broad agreement with those reported in earlier studies, e.g. the Ahtisaari and Aga Khan reports (United Nations, 1991a, 1991b).

²⁹. The food price indices presented in **Table 2a** are based on pre-sanctions consumer expenditure patterns, and it may be argued that they would, for that reason, tend to overestimate the increase of food prices (since the scope for “substitution” in response to price changes is ignored). However, the bias is likely to be small, since compensated demands for essential food commodities are typically quite “inelastic”. Note also that food price indices for poor households specifically would have risen to higher levels than those indicated in **Table 2a**, since these households tend to spend a relatively large proportion of their income on staple foods, which are precisely the items that have seen the highest price rises since August 1990.

³⁰. This damage is documented in greater detail in other parts of the International Study Team report.

³¹. Given these shortages, power supply is no longer a binding constraint in areas where it has been restored. However, this constraint is likely to emerge again when the sanctions are lifted.

³². For some commodities, sanctions have had a perverse effect, with goods smuggled from abroad replacing locally-processed products. For instance, Iraq used to import raw materials for the packaging of tomato paste and cooking oil. The packaging firm which accounts for a large portion of the market for both these products is now idle due to its inability to import the raw materials. At the same time, however, traders with reserves of foreign currency are importing canned tomato paste and cooking oil from neighbouring countries.

³³. In terms of employment, it is second only to agriculture in the non-service activities.

³⁴. Apart from this, over 350,000 retired government employees receive state pensions worth an average 120 dinars a month.

³⁵. The World Food Programme currently supplies these destitute households with free food rations (as supplements to their entitlements from the public distribution system), partly compensating this loss of real income through price increases.

³⁶. The increases in meat prices that immediately followed the recent announcement of public-sector pay rises (see Section 3.4) illustrate this point.

³⁷. Other commodities that have been distributed from time to time since August 1990 include soap, razor blades and tobacco. However, the rations distributed - and the implicit income transfers they represent - are small and of marginal relevance to the concerns of this report.

³⁸. The extensive involvement of the state in public provisioning fits with the “socialist” ideology of the Ba’ath party, but may also derive from other political or ideological motives.

³⁹. Before August 1990, food was not rationed, but (as we saw in Section 3) the Ministry of Trade already had a long record of involvement in the importation of food and its distribution at subsidised prices. The public distribution system as it exists today builds partly on that earlier experience.

⁴⁰. Children below the age of one do not receive the standard rations. Instead, they are entitled to monthly rations of milk-based “infant formula” (currently 4 tins of 450 gm each), if the mother can produce a certificate stating that she is unable to breast-feed properly.

⁴¹. This statement is based on our own calculations, based on information for pre-crisis consumption from United Nations (1991c, Annex I) and United Nations (1991b, Annex 2). The latter study (as well as WHO/UNICEF, 1991) suggests that the calorie content of food rations has risen quite substantially since the war, when it stood somewhere between 750 and 1,000 calories per day.

⁴². Indeed, when a household acquires food rations, it has to surrender a sum of money equal to the value of these rations at official prices, but it also acquires income-in-kind equal to their value at market prices (i.e. it economises the income that would have been needed to purchase these rations at market prices). The difference is the net (implicit) income transfer.

^{43.} We did not visit these areas ourselves, but we have benefited from observations made in these areas by other members of the International Study Team.

^{44.} The test is more difficult to carry out (and also less significant) for other commodities, because respondents are not always clear about the precise quantities they receive for the secondary items, especially when these quantities cannot be expressed in round numbers. In the case of wheat, the norm of 8 kg per person per month is generally understood.

^{45.} The plausibility of these reported deviations from the norm is somewhat questionable. In a number of cases, per-capita rations had to be inferred by dividing the reported total quantity obtained by the reported number of household members. This is not an entirely reliable procedure, as it compounds two possible sources of error.

^{46.} According to the survey results reported in Table 5, agents charge slightly higher prices in rural areas than in urban areas (although the difference is not statistically significant). This may reflect the greater awareness of official prices, and lesser vulnerability to cheating, of urban residents.

^{47.} We were told, for instance, that attempts to obtain a second ration card are punished with immediate exclusion from the public distribution system. Aside from the deterrent effects of penalties, it is worth noting that the incentives to cheat are, in some respects, quite low. For instance, under the coupons system, agents have no incentive to sell the rations on the open market (as often happens under different administrative arrangements), since the implicit value of a coupon is the same as the market value of the amount of food it gives access to.

^{48.} This cannot be attributed to some general fear of criticising the establishment. Indeed, many of the respondents had a demonstrated ability for frankness. One of them was as eloquent in his tirades against Saddam Hussein as in praising the public distribution system.

^{49.} In this connection, it should be remembered that the monthly salaries of ordinary soldiers are, in comparative terms, very low - even lower than the monthly salaries of unskilled labourers in public-sector industries (see Table 3).

^{50.} For a useful review of public distribution systems in other parts of the world, see Pinstrup-Andersen (1988).

^{51.} The following account of economic conditions during the crisis is based partly on first-hand observations by the first author of this report (who was in Iraq with the Gulf Peace Team from mid-November until the end of January), and partly on extensive household interviews conducted in the course of our field work in August and September 1991 (see Section 5.3 for further details). See also Bhatia et al (1991).

^{52.} It should also be remembered that, during the crisis, food rations only amounted to something like 1,000 calories per person per day (see section 4.2), when they were at all distributed.

^{53.} For first-hand accounts of war-time food deprivation by Iraqi women, see Bhatia et al (1991). It might be mentioned that very few households had substantial food stocks during the crisis, which followed six months of food scarcity and high prices.

^{54.} See the Community Health Survey section of the International Study Team report.

^{55.} It should be emphasised that it is the combination of implacable war and prolonged sanctions (imposed on a country highly dependent on food imports) which proved fatal. Many of our respondents commented that, during the Iran-Iraq war, they had not experienced anything like the decline of living standards which they suffered during the recent Gulf Crisis.

^{56.} Statements (1) and (2) in the list are based on the food price index ("low case") derived in Table 2a. The other statements are independent of any particular choice of price index.

^{57.} In India, this poverty line is calculated as the level of income (more precisely, expenditure) at which calorie requirements are met, given observed expenditure patterns.

^{58.} It should not be thought that households typically cut down their consumption only after their assets are exhausted. In fact, empirical evidence strongly suggests that, in times of famine and pronounced economic decline, affected households often chose to endure quite drastic cuts in consumption - including that of food - in order to contain the loss of assets (see Drèze and Sen, 1989).

^{59.} As was discussed in Section 4.3, this statement does not apply in Kurdish areas outside the control of the government.

^{60.} On the background of this debate, see Section 2.2.

^{61.} Such claims have apparently been made in intelligence reports discreetly circulated within the United Nations; these reports argue that Iraq does not need humanitarian assistance because illegal transactions ensure adequate commodity supplies (personal communication from UN officials).

⁶². A recent editorial in the London-based Independent, for instance, suggests (after commenting on Saddam Hussein's reluctance to accept Resolution 706) that "aid workers distributing food and medicines... could be sent in against his [Saddam Hussein's] wishes, backed by the threat of military action if he interferes" (The Independent, 13 September 1991, p.18).

⁶³. The Aga Khan report (United Nations, 1991b) reached a similar conclusion on this point. Analogous remarks are likely to apply for other areas of public provisioning such as health care.

⁶⁴. We need not concern ourselves, in this discussion, with the argument that the unstated aim of the embargo is to drive the Iraqi people to desperation and, ultimately, revolt. Such a strategy would be both immoral and undependable, and cannot count among reasoned arguments for the continuation of sanctions. This is not to deny that the veto-holding members of the Security Council have the power to implement such a strategy if they wish (by obstructing any relaxation of the sanctions).

⁶⁵. See United Nations (1991a), pp. 7–12, and United Nations (1991b), pp. 9–10.

⁶⁶. UN Security Council 706 (1991), para 1(d).

⁶⁷. It is interesting that the figure of US \$1.6 billion mentioned in Resolution 706 (which, as mentioned earlier, comes down to about US \$1 billion after due allowance for war compensation and related uses) happens to coincide with the Aga Khan report's estimate of the cost of minimal food imports under its conservative scenario (p.8).

CHILD PSYCHOLOGY STUDY

The Impact of the Gulf Crisis
on Children in Iraq

BY

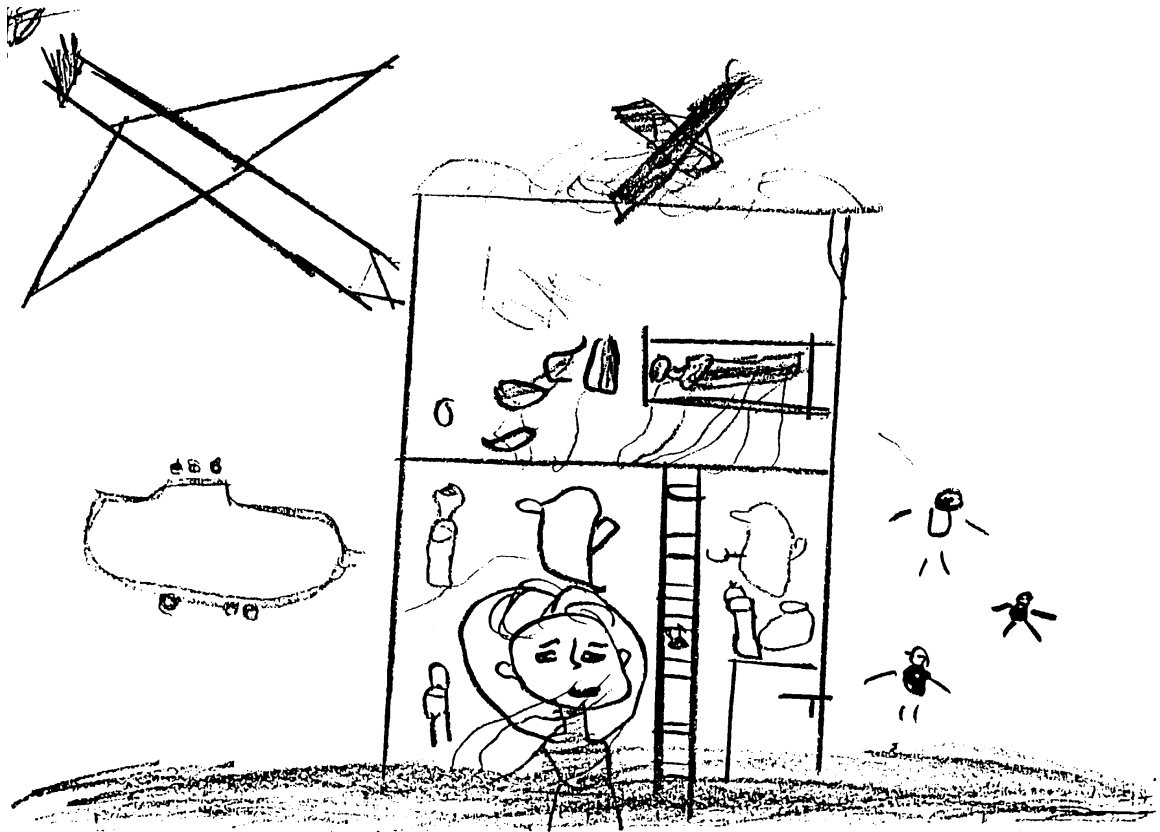
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1 INTRODUCTION Children experiencing conflict at close range are invariably forced to endure conditions of severe hardship and stress leading to long-term psychological manifestations of such exposure. Despite the serious impact of conflict stress, there are few examples where researchers have sought to investigate and quantify such exposure and its subsequent effect on child behavior. Recent events in the Gulf have generated what may well be an unprecedented level of anxiety and post-conflict stress among children residing throughout the Middle East.

The results of the current study, carried out in Iraq, reveal a level of psychological stress that is the highest the authors of this report have seen in 10 years of conflict-related research. The degree of stress and pathological behavioral change found during the course of this research far surpasses levels obtained by the authors during their own research in Mozambique, Uganda and Sudan.

Addressing the post-war psychological needs of children who experienced the Gulf Crisis at close proximity is a high priority that merits serious and substantial attention.

2 METHODOLOGY From 23 August to 4 September 1991, a total of 214 Iraqi children of primary school age were interviewed to assess the psychological impact of the recent conflict. Two child psychologists, assisted by arabic-speaking, non-Iraqi psychology students, conducted the in-house interviews. Both child psychologists are recognized as leaders in the field of conflict-related stress and have extensive experience investigating the impact of conflict on children - particularly in Mozambique, Uganda and Sudan.

One-hundred seven children were sampled from each of two locations within Iraq:

- i) Al Ameriyah neighbourhood, Baghdad (site of shelter bombing); and
- ii) City of Basrah.

Several psychological assessment methods were used by the study team, including:

- i) The Impact of Event Scale;
- ii) The Post-Traumatic Stress Reaction Checklist;
- iii) The Child Behavior Inventory.

These methods will be discussed in detail in the corresponding sections of this report.

In addition to the 214 children mentioned above, the caregivers of a further 127 children were questioned to ascertain the children's post-conflict behavior. A standardized questionnaire (the War Event Survey) was administered by members of the Mortality and Nutrition Survey Team. Team surveyors randomly selected one household in each of 127 neighbourhoods visited by the Survey Team.

Finally, more intensive child and caregiver interviews were conducted on an ad-hoc basis, to elicit in-depth information regarding the child's experience of conflict. This methodology included the use of other research instruments (for example, picture drawing, play and story writing).

3 FINDINGS An analysis of the results of the various survey methods used, together with a preliminary interpretation, is provided below.

3.1 The Impact of Event Scale The Impact of Event Scale (IES) provides a measure of intrusive thinking and avoidance behaviour associated with traumatic life events. The IES is currently the most reliable and valid instrument for assessing the impact of traumatic events on individuals. It has been used to measure the impact of various disasters throughout the world and is considered a sensitive instrument as well as an effective means of assessing the psychological consequences of disaster. Unfortunately only a few studies consisting of small samples of traumatized children have been published.

The intrusive sub-scale of the IES draws upon the signs and symptoms of intrusive (invading, disturbing) cognitions and affects. The avoidance sub-scale of the IES draws upon avoidance behavior, denial or the blocking of thoughts and images. The scale was administered to 107 children in Al Ameriyah neighbourhood, and a further 107 children in the city of Basrah. Some of the results are presented below.

<u>QUESTION ASKED OF EVENT</u>	<u>PERCENT ANSWERING 'YES'</u>
Do you think about the event when you don't mean to?	92.1%
Do you avoid getting upset when you think about the event or are reminded it?	76.4%
Do you try to remove the event from your memory?	81.3%
Do you have sleep problems (i.e. problems staying or falling asleep) because of pictures and/or thoughts about the event coming into your mind?	73.9%
Do you have waves of strong feelings about the event?	88.8%
Do you dream about the event?	51.8%
Do you stay away from reminders of the event?	68.3%
Do you feel as if what happened wasn't real?	78.3%
Do you try not to talk about the event?	68.4%
Do pictures about the event pop into your mind?	87.8%
Do other things make you think about the event?	90.1%
Do you still have a lot of feelings about the event, which you cannot express?	59.9%
Do you try not to think about the event?	82.7%
Does any reminder bring back feelings about the event?	91.4%
Are your feelings about the event sort of numb?	66.1%

3.1.1 Calculation of Intrusion/Avoidance Scores For comparative purposes, a weighted tabulation of responses to the above questions yields scores that are indicative of the severity of behavioral disturbances.

<u>SCALE USED</u>	<u>INTERVIEW LOCATION</u>	
	Al Ameriyah (Baghdad)	Basrah
	107 children	107 children
<u>Intrusion Score</u> (3 – 35)	21.9	24.9
<u>Avoidance Score</u> (3 – 40)	21.8	26.4

3.1.2 Discussion The Intrusion Scores for interviewed Iraq children are 21.9 points and 24.9 points for Al Ameriyah and Basrah respectively, out of a maximum score of 35 points. The mean score for the two locations combined is 23.3 points.

The Avoidance Scores are 21.8 points and 26.4 points for Al Ameriyah and Basrah respectively, out of a maximum score of 40 points. The mean score for the two locations combined is 24.2 points.

These figures reveal a highly disturbed population of children who are exceedingly bothered by intrusive thoughts of the war. The entry of these thoughts into the childrens' waking/sleeping mind are out of their control and, in many cases, remain the dominant thought making up their conscious memory.

Affected children try to avoid thinking of such painful thoughts, try not to be upset when reminded of the events, and try to remove such thoughts from their memory - but it is impossible for them to keep these disturbing memories at a reasonable distance.

The children interviewed commented on their efforts to protect themselves from these tormenting inner "pictures" as useless. "I try every day, but it is impossible not to think about it" was a common, spontaneous statement.

3.2 The Post-Traumatic Stress Reaction Checklist Several of these questions are drawn from the Impact of Event Scale (IES) and are part of a protocol compiled by the "Bergen-Columbia Group" for studies of war-affected children. This Group includes Magne Raundalen, Atle Dyregrov, Mona Macksoud and Larry Aber.

3.3

<u>QUESTION ASKED OF EVENT</u>	<u>PERCENT ANSWERING 'YES'</u>
Do you often think about the event now?	86.7%
Do you often get scared or upset when you think about the event?	79.4%
Do you often go over in your mind what happened, like seeing pictures or hearing sounds of what happened?	77.6%
Do you often dream about the event?	50.0%
Do you sometimes feel as if the event is happening all over again?	48.9%
Do you stay away from situations or activities that make you remember what happened?	55.2%
Do you try not to think about what happened?	73.5%
Do thoughts or feelings about the event make it hard for you to remember things well, like remembering what you have learned in class?	56.3%
Since the event happened, do you feel more alone inside, as if your friends or parents don't really understand how you feel?	57.4%
Since the event happened, do you worry that you may not live to become an adult?	62.2%
Since the event happened, do you enjoy playing with friends, doing sports, or participating in other fun activities less than before?	74.7%
Since the event happened, do you have difficulties falling or staying asleep during the night?	65.6%
Since the event happened, do you jump at loud noises or at unexpected things?	75.5%
Since the event happened, is it more difficult for you to pay attention or concentrate on things than before?	62.5%

(Percent answering 'yes' to Inventory questions includes children answering either "sometimes" or always").

3.2.1 Discussion Results of the Post-Traumatic Stress Reaction Checklist demonstrate that the large majority of the children interviewed suffer from anxiety and fear associated with memories of the Guld Crisis. The children still suffer from the immediate impact of the event as well as the grief associated with the loss of close friends and relatives.

Despite trying to block the memory from their minds, 50 per cent of interviewed children continue to dream of the event, 66 per cent have difficulty sleeping because of the memory, and 63 per cent are having difficulty with concentration.

Three-quarters of the children interviewed find little joy in playing with friends, in sports, and other similar activities.

A full 62 per cent of the children interviewed worry that they may not live to become an adult.

3.3 The Child Behavior Inventory This inventory attempts to focus on the emotional and behavioral disturbances caused by the traumatic nature of the event. As such, the inventory asks questions concerning the child’s feelings of loneliness, fear, anger and anxiety. The inventory was compiled by the “BergenColumbia Group” for studies of war-affected children.

<u>QUESTION ASKED OF EVENT</u>	<u>PERCENT ANSWERING 'YES'</u>
Do you cry easily?	68.0%
Do you feel sad or unhappy?	76.3%
Do you worry about many things?	72.2%
Do you feel unloved?	20.2%
Are you afraid of losing your family (through death or separation)?	78.4%
Do you feel tired?	67.0%
Do you prefer being alone rather than around friends or family?	18.6%
Do you feel lonely?	47.3%
Do you feel worthless?	23.7%
Do you feel helpless?	36.6%
Do you get angry easily?	61.5%
Do you get irritable easily?	63.8%
Are you verbally aggressive? For example, yelling, swearing, verbally threatening others.	58.3%
Are you physically aggressive towards others? For example, hitting, pushing, physically	34.4%

intimidating others.	
Do you destroy your or other people's things?	10.5%
Do you disobey your parents or teachers?	14.7%
Are you hot-tempered or explosive?	34.8%
Do you violate the important rules of the community?	7.5%
Do you blame others for things that are your own fault?	16.3%
Are you jumpy?	67.7%
Are you scared of things or situations that don't usually scare other children?	37.4%
Are you frightened that something bad will happen to you?	65.0%
Are you scared of new situations? For example, going to new places, meeting new people.	55.3%
Is it hard for you to concentrate on your schoolwork?	52.1%
Is it necessary for you to be with an older person to feel safe and secure?	72.6%
Do you wet your bed at night?	2.1%

3.3.1 Discussion One of the most worrisome features of the results of the Child Behavior Inventory is the high proportion of interviewed children who were experiencing sadness and worry. Seventy-five per cent of the children feel sad and unhappy, worry for the survival of their family, and need the company of an older person to feel safe. Nearly 4 out of 5 children interviewed expressed fear of losing their family through death or separation.

During the interviews, the theme of survival guilt was also brought up. Although this question was not part of the systematic study, a vast majority of those children asked, felt the burden of depression and guilt because they had survived and their friends had not.

3.4 Preparedness for the Future This concept comprises the child's efforts to contemplate and subsequently build up a reasonable expectation for the future. In earlier studies conducted in Mozambique, Uganda and the West Bank, the authors attempt to map out how children are constructing the prospects for their personal and national future. From these studies it is clear that international political questions are part of even small childrens' prospects (see 3.5 The Political Frame of Understanding).

The following questions were asked of both the interviewed child and her/his parent/caregiver.

	Percent answering 'YES'	
	Asked of the child	Asked of the parent
Since the event happened, does the child seem worried that she/he might not live to become an adult?	62.2%	38.5%
Does the child worry about many things?	72.2%	52.3%
Is the child afraid of losing her/his family through death or separation?	78.4%	61.4%
Has the child indicated that she/he is frightened that something bad will happen to him/her?	65.0%	37.2%

3.4.2 Discussion These figures reveal that Iraqi childrens' prospects for the future have been deeply effected by the recent Gulf Crisis. Sixty-two per cent of children interviewed doubt that they themselves will survive to become an adult. An even greater proportion of children (78 per cent) fear losing her/his family. Taking into account that more than six months have elapsed since the ceasefire, these figures are judged as exceedingly high. The events of the recent conflict appear to have been integrated into the child's future expectations as a very negative element.

The gap between the childrens' own reports and those of their parents' shows that many of the children have to struggle with this pessimistic prospect on their own.

3.5 The Political Frame of Understanding This component of the study was based on open conversation with the interviewed children, as well as interpretation of their writings about the future.

3.5.1 Confusion about what really happened Some children expressed confusion about what really happened:

“Still I don't know who first attacked Kuwait and why it all happened.

“For many of the children interviewed, they believe that the events of the recent past may easily happen again since they have no idea of why the conflict/events happened in the first place. It must also be considered that some of the children do not openly speak about the conflict.

3.5.2 The 'secret' version of what really happened Some interviewed children recounted a version of the following story:

Saddam Hussein took Kuwait and that was wrong and then Bush helped Kuwait and said it was because it was a little country, but that was wrong because he was interested in controlling the oil and then he took Kuwait back and attacked Iraq and that was wrong also, but this is a secret. Although this part of the study was not systematically chosen, detailed discussions with the interviewed children generally arrived at the above description of events.

3.5.3 The 'official version of what really happened When children were asked about the reasons

behind the conflict, they generally began by stating that it was an attack from the USA, personified by the name Bush. Even 6-7 year old children talk about Bush. When asked, some of the younger children would recount how Bush was sitting in a plane from where he bombed Iraq. Older children complete the anti-Bush version by declaring a victory for Iraq in the future, with some children also talking about revenge.

3.5.4 The view on sanctions The parents and caregivers, together with their children, often gave comments regarding the sanctions and thus, indirectly, regarding the war.

The authors of this report clearly got the feeling that it is the sanctions much more than the war itself that create aggression, feelings of revenge, and negative anti-American attitudes in the population. This must be carefully interpreted.

3.6 The War Event Survey: Trauma, Separation and Loss As mentioned in section two, about a series of questions, directed at the parent/caregiver of the child, were asked to quantify exposure to conflict, as well as statistics on trauma, separation and loss. The War Event Survey was conducted by the Mortality and Nutrition Survey Team on a additional 127 children.

Although the majority of children interviewed for the War Event Survey were from Baghdad, interviewees were also selected from most other regions within Iraq. The Survey focuses on the child's actual exposure to the physical hazards of conflict (bombing, shelling, shooting) as well as temporary and permanent separation from family members.

<u>QUESTION ASKED OF EVENT</u>	<u>PERCENT ANSWERING 'YES'</u>
Did the child experience:	
– shelling	79.7%
– air raids	79.5%
– shooting at close distance	61.9%
– own home destroyed	25.6%
– being shot at	13.0%
– being wounded	13.5%
Due to the war, was the child separated from:	
– the mother or primary female caregiver	5.0%
– the father or primary male caregiver	39.5%
– both mother/father or caregivers	2.5%
Has the child lost close family members during the war?	
– mother	8.7%
– father	2.5%
– others	33.6%
Has the child's behavior changed after the war?	82.4%
– more anxious and fearful?	81.5%
– more depressed and sad?	76.6%
– more angry and irritable?	79.8%

3.6.1 Discussion The high proportion of children who directly experienced shelling, air raids or shooting at close distance provides at least a partial explanation for the high prevalence of behavioral changes.

While only a small percentage of children experienced separation from the primary caregiver (the mother), the loss of family members and relatives will have a lasting negative impact on the child.

When parents and caregivers were asked to comment on their child's behavior following the conflict, the vast majority stated that their children have experienced serious psychological reactions to recent events. It is important to note that these behavioral disturbances remain more than 6 months following the ceasefire declaration.

This component of the study clearly shows a highly exposed child population in which probably NONE of the children were unaffected by the Gulf Crisis.

3.7 Basrah Family Study Twenty-five families residing in three city neighbourhoods of Basrah (Al Hakimiyeh, Hay al Shuhada, and Al Tamimieh) were also interviewed regarding their wartime experiences of trauma, separation and loss. The neighbourhoods chosen were deemed to be representative of the entire city of Basrah which was severely affected by both the war and the civil uprisings. All three neighbourhoods showed visible evidence of residential destruction.

Number of families = 25
Number of children = 89

<u>VARIABLE</u>	<u>PERCENT AFFECTED</u>
<u>TRANSITION/STRESS</u>	
Number of families having to leave the home	92.0%
<u>Trauma</u>	
Houses directly affected	100.0%
Families with members directly hurt	28.0%
Families who saw dead/wounded	52.0%
<u>SEPARATION</u>	
Families separated from the father	60.0%
Families separated from the mother	12.0%
Families separated from both mother and father	8.0%
<u>LOSS</u>	
Loss of parents	16.0%
Loss of close relatives	44.0%
Loss of close friends/neighbours	76.0%

4 Conclusion The results of the various studies reported above reveal that the majority of Iraqi children interviewed suffer from:

- i) Emotional reactions - depression, sadness, anxiety and fear.
- ii) Cognitive reactions - sleep and concentration problems.
- iii) Prospective reactions - worries about the future.

The proportion of children interviewed suffering from the above reaction conditions is the highest ever recorded by these authors in over 10 years of experience in conflict-affected areas.

5 Comment The most significant impression from the interviews of the children, in both Baghdad and Basrah, was their lack of “life”, their deep depression, sad appearance, tiredness, and lack of joy. Iraqi children are affected in their cognitive functions by fatigue, lack of energy, concentration problems, and confusion about what happened and why. They are deeply disturbed in their prospective thinking and many seriously consider it likely that they will not survive to adulthood.

The most serious conclusion to be drawn from this material is that what happened to these children — the severe psychological trauma — may cause them serious problems for years to come. For some children, these problems may endure for their entire lifetime.

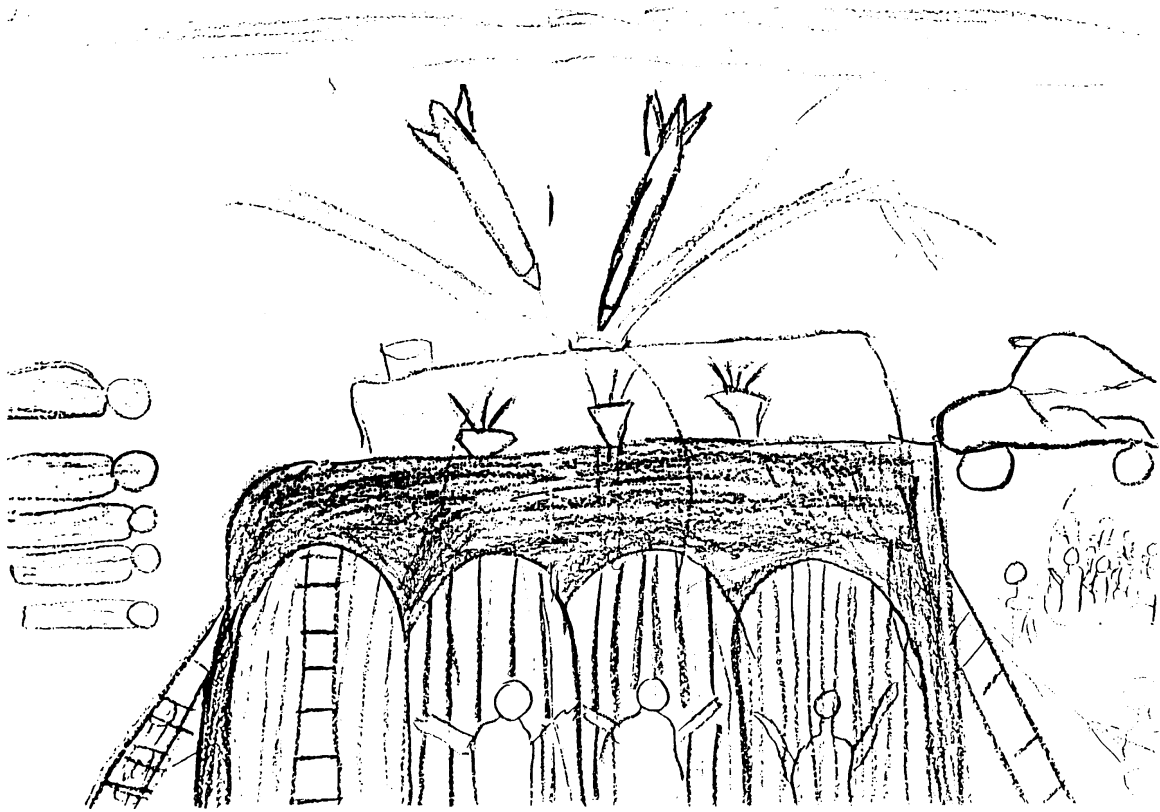
Recent studies from Finland investigating the after-effects of the “Winter War” of 1939 reveal serious effects even 50 years following the event itself. The children studied in Iraq all have signs of being seriously disturbed by their traumatic experiences and by the current difficult situation. They are affected in their emotional life by grief, sadness and desperate fear.

The current study also reveals the widely observed fact that adults constantly underestimate what their children have, in fact, experienced, and how their children suffer psychologically from such experiences.

The children interviewed strive to frame and to understand what they saw; planes bombing, houses collapsing, fires burning, soldiers fighting, mutilated and crushed bodies, and burned out trucks. The children fight to forget what they heard: people screaming, desperate voices, planes, and explosions.

The children are haunted by the smell of gunfire, fuel from planes, fires, and burned flesh. Many children are still struggling with the memories of what they touched: remains of planes, blood, dead bodies and wounded relatives.

And every night these children go to bed with the memories of the terrible sounds, shaking grounds, and the prospects of the whole family being buried in the ruins of the house.



WOMEN'S SURVEY

The Impact of the Gulf Crisis
on the Women in Iraq

by

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Mary Kawar
Mariam Shahin

October 1991

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This report is dedicated to

Aftah, Ahlam, Alia, Alia B., Angela, Camilie, Faddila, Farah, Fathieh, Fathiya, Fatima, Fatimah, Fatin, Fatina, Hadeel, Hasna, Iman, Jamila, Jonaz, Kamila, Kamila B., Karimah, Kashwar, Khadija, Khalida, Latifa, Leila, Liela B., Madina, Majida, Mariam, Naela, Naima, Najeha, Naseeba, Nazika, Nver, Raja, Rajaw, Ramla, Saedia, Sakeena, Salma, Sharifeh, Siham, Suad, Suad B., Suam, Thuraya, Um Ahmad, Um Al Khudra, Um Ali, Um Ali B., Um Amar, Um Amar B., Um Ammar, Um Arkin, Um Bassem, Um Farah, Um Fares, Um Hussein, Um Ibrahim, Um Jassim, Um Mahdi, Um Mohammad, Um Mudar, Um Raad, Um Riad, Um Saad, Um Sabah, Um Salam, Um Samir, Um Samir B., Wafa, Wahida, Zahira, Zahra, Zanuba, and Zeina. ... for your courage in continuing to struggle and to hope;

and to all those friends who refuse to stand as helpless witnesses.

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1 ABSTRACT The first-hand testimonies of eighty Iraqi women, on which this report is based, provide a disturbing account of the hardship being faced by the Iraqi people as they struggle to endure the current crisis. The Gulf War, the ensuing civil disturbances and more than one year of economic sanctions have had a devastating impact on Iraqi families and Iraqi society.

The results of this study show that Iraqi people are victims of a continuing process of impoverishment. Economic sanctions have resulted in large price increases, massive unemployment, and a drastic reduction in real wages. Having utilized all their savings, 55% of the women interviewed report having had to sell their jewelry and other assets; 40% have incurred heavy debts. Some have even been driven to prostitution and begging. Vulnerable sections of the population including widows, abandoned, and divorced women have been worst affected.

The sanctions, along with damage to the electricity, water and sanitation infrastructure caused by the Gulf Crisis, have had a damaging effect on child mortality and women's health. According to gynaecologists, the incidence of miscarriages and low birth-weight babies has significantly increased. Most women patients admitted to hospitals are severely anaemic. Only emergency operations are being performed, and even cesarian operations are carried out with the minimum of anesthetics. A lack of reliable birth control has led to an increase in abortions, sometimes resulting in death of the mother.

Due to physical and psychological hardship, 57% of the women reported suffering from health problems, including psychosomatic symptoms such as sleeplessness, weight loss and headaches.

Eighty per cent of women interviewed responded that prevailing conditions of hardship have placed additional burdens on their already considerable domestic responsibilities. Shortages of electricity, fuel and water have meant that women must secure water and firewood for their families on a day-to-day basis. Shortages of food occur in almost every household, leading to malnutrition and further limiting women's ability to provide for the family.

These added domestic burdens fill whatever little spare time women had prior to the conflict. While 74% of the women interviewed indicated that men's roles within the household had not changed, it became clear during the survey that women are not only responsible for nearly all household tasks, but also for providing stability to the family unit.

Many women indicate that their children often have nightmares and that their husbands are irritable. A number of the women interviewed appeared to be suffering from depression, especially those who had lost family members during the crisis. The lives of Iraqi people now take the form of a daily struggle to satisfy basic needs, especially the need for food. Women fare the worst, and Iraqi families owe much to them for their survival.

2 INTRODUCTION

2.1 Motivation The Gulf War, the ensuing internal conflicts and the continued economic sanctions have had a devastating effect on the Iraqi people and Iraqi society. In the aftermath of the war, the people of Iraq are still fighting a daily battle against the hardships imposed upon them by the on-going sanctions. This impact on the Iraqi people cannot be fully understood until one encounters them inside their homes.

The aim of this study, therefore, is to understand the impact of the Gulf Crisis as experienced and perceived by Iraqi women. These testimonies, from ordinary women, demonstrate how this experience has affected Iraqi women, their role and status in Iraqi society, and how the lives of the Iraqi people, as a whole, have been dramatically and tragically altered.

2.2 Methodology The research for this study was carried out between August 24 - September 7, 1991. Three female researchers, experienced in the field of women's studies and community development, spent a total of 40 person-days during which period they were able to conduct 80 in-depth interviews with

individual women. Two of the three researchers were fluent in Arabic and required no interpretation. The third carried out the first part of her field work with an interpreter from Jordan and the second part with an interpreter, of her own choosing, from Baghdad. During the entire research period, the study team travelled extensively throughout the country without any restriction. (The field work was conducted in 10 of Iraq's 18 governorates, covering 43 different locations. All field investigations were carried out independent of Iraqi authorities or other personnel apart from those mentioned above.

The basis of the study was not only quantitative analysis but also in-depth testimonies which illustrate the lives of Iraqi women and their families both during and after the war. In addition to individual interviews, group discussions were also encouraged. Finally, first-hand observations by the researchers themselves were incorporated into the study's findings when appropriate.

Open-ended interviews, guided by a common questionnaire formed the basis of the study format (see Appendix 1). This format permitted comparison between women of different regions and backgrounds. However, the questionnaire was not restrictive in nature and served more as a guideline, allowing women the opportunity to discuss their own concerns and experiences.

The areas explored in the questionnaire were:

- (i) Economic conditions, food and subsistence;
- (ii) Health and sanitation;
- (iii) Social aspects within the family and society;
- (iv) Psychological impact; and,
- (v) Future aspirations.

The composition of the selected household sample was guided by certain factors including geographical area, urban-rural distribution, and economic condition. In order for the sample to be as widely representative as possible, we selected respondents from several areas in each of the northern, central and southern regions of Iraq. Similarly, sampling was undertaken in a manner that would roughly correspond to the urban-rural distribution of the population.

Accordingly, 27.5 per cent of the total sample was selected from the north (Dohuk, Nineveh and Sulaymaniyah governorates), 37.5 per cent from the central region (Baghdad, Anbar and Babylon) and 35 per cent from the south of Iraq (Kerbala, Najaf, Maysan and Basrah) (**Table 1**). Of the 80 households interviewed, 69 per cent were from urban areas. The majority of interviews were conducted with the female head of middle or low income families. In many instances, adult males were absent, and female neighbours would sit in on the interview.

The length of individual interviews ranged from one to three hours. It was felt necessary to first spend some time building rapport with the respondents to encourage them to speak without inhibition.

In addition to interviews with women in the households, discussions were held with female doctors in various hospitals, and with representatives of the government, various aid agencies, and bodies such as the General Federation of Iraqi Women.

3 PROFILE OF THE RESPONDENTS The profile of the interviewees includes: age, marital status, education, number of children, household size, occupational status, and household income. (see **Appendix 2**).

Among the women sampled, 56 per cent were below 40 years of age, 28 per cent were in the 40-50 year age group and 16 per cent were above 50 years.

Married women were dominant among the interviewees. Of the 80 respondents, 60 were married, 15 were widows, 2 were divorced, 2 were single and 1 was abandoned. Age at marriage for the majority of respondents was between 15 to 19 years (see **Table 2a**). This standard of literacy is somewhat lower than for the female population as a whole (see **Table 2b**).

More than half of the respondents had not received any formal schooling. Those who had gone to school had discontinued their education after the 4th or 5th grade.

Fifty per cent of the respondents had five or more children. This high fertility rate reveals the expectations that the society has for women and the roles assigned to them. Women are seen as child bearers and expected to have children soon after marriage.

In the past decade, government policy has both favored and encouraged higher fertility among women. Contraceptives were declared illegal during the eight-year war with Iran. Immediately following the most recent conflict, a similar campaign was reportedly sponsored reiterating this legal condition. According to one female gynecologist, this policy was been modified in April 1991 and the ban on contraceptives has now been lifted. However, due to the sanctions, contraceptives are rarely available.

Thirty-nine per cent of the sample had households with 11 or more members in the family. An equal number had 6-10 members in the family. Besides the high fertility rate, another important reason for this large family size is the extended nature of households. More often than not, women were found to be living with their husband's relatives, generally his parents and brothers, and sometimes with the families of these relatives as well.

Despite the large families, most of the homes were usually consisted of only two to three rooms with a courtyard in the center. We observed that the social organization within such households was based on seniority. Accordingly, younger women in the family were found to bear greater work burden than older women.

The occupational status of the interviewees was predominantly that of housewife (90 per cent). According to the latest information available (1987), female participation in the labour force remains low at 12 per cent of the total labour force (**see Table 2c**).

Only nine women in this study were engaged in paid labour outside the household. These women worked in informal-sector activities such as selling vegetables or in service-sector activities such as teaching and the medical field. These nine women were either equal contributors to the family income or, as in five cases, the only income earners in the family. Among the women who identified themselves as housewives, 11 were, in fact, unpaid family workers on the farm or in the shop.

The average household income was found to be low (**see Appendix 2**). Of the total respondents, the average monthly income was as follows:

- 55 per cent had an income of below 200 dinars,
- 30 per cent had an income between 200-400 dinars,
- 6 per cent had income in the range of 400-600 dinars, and only
- 4 per cent had income above 600 dinars per month.

4 EMPLOYMENT AND INCOMES The war and sanctions have led to a sharp deterioration in formal employment. During the war and the internal conflicts that followed, most sources of employment came to a standstill. In the aftermath of the war, the destruction of industries, power and telecommunications systems, as well as shortages of spare parts due to the economic blockade, prevented a speedy recovery from taking place.

The sharp reduction of real income from wage employment and pensions has led many people to seek ways of employing themselves. Distress sales of assets and indebtedness, besides being necessary to basic food needs, have also been used to raise capital for these alternative sources of employment. As Alia, a 35 year old women from Amara, speaking about the plight of families in her neighbourhood reported,

“Men came back from the army and women had to sell their gold. My neighbour had to sell her gold to get 2000 dinars so that her husband could set up a shop.”

Many of the women who are the sole income earners in their families have great difficulties feeding their children. As the story of Hadeel's mother reveals:

Hadeel's mother is a 45 year old widow, who has been providing for her four children for the last 16 years by vegetable vending. It is a hard day's work, at the end of which she sometimes makes 5 dinars, sometimes 10. She goes everyday at 4.30 in the morning with four other women, who are also vegetable vendors, to an area called Khamsameel which is half an hour away from her home in the Al-Muraba quarter in Basrah. The morning drive to Khamsameel and back costs her two and a half dinars. Depending on her kabiliyat (capacity), determined by how much money she earned the previous day, she buys vegetables worth 25 to 50 dinars. Most of the vegetables she buys are green leafy vegetables (e.g. barbeen, rehan, karophes) and beetroot rather than onions, potatoes and tomatoes, which are too expensive. Showing bundles of these green leafy vegetables, Hadeel said, "My mother buys each bundle for 200 fils and sells them for 250 fils. After coming back from Khamsameel, she carries these vegetables in a basket on her head and walks to the sukh (market) which is 15 minutes away. If she is lucky, she is able to find a shaded place in the crowded sukh. If not, she sits under the sun. She waits until she has sold all her vegetables before she returns, often alone, at around 8 or 9 in the evening. Yesterday she made 5 dinars.

She could not sell during harb Bush (Bush's war), especially during the last two weeks of the war and during the whole month of the riots. With a smile Hadeel continued, "She was hiding under the blanket out of fear! We were telling her at that time that she is supposed to protect us, but she said that she cannot help feeling nervous when she hears the planes." She added, "But fear or no fear, she has to work under any conditions. Our only source of income is mother's income. We have only God and my mother to take care of us."

There were other women who had to surrender to the circumstances created by the sanctions and the war and could not continue. Such is the situation of Karimha.

Karimha is thirty-six years of age and has been a widow for the last nine years. Since her husband died, she and her six children, have been living with her parents, who are a strong source of support for her.

For the last four years, ever since she was able to get a license from the government, Karimha has been baking bread to be used for making sandwiches. She explained,

For the license, I applied through the manager of a wheat factory and supported it with evidence that I am a widow. This license is only for the poor and the needy. In this locality, there are more than 200 women bakers - among them many who have orphans to feed.

With the license, before the war and sanctions, I used to buy a bag containing 85 kg. of wheat flour for 2 dinars and 750 fils. In the open market, it was available for half a dinar more. I would utilize 12 to 15 such bags in a month. To bake, I sometimes used one gas cylinder a day. My whole chest would become red due to the constant heat and the sweat. My one married sister, Yaze, helped me because her husband got only 20 dinars a month as a trainee soldier. But now how can I continue baking? One kg of wheat costs two and a half to three dinars. In addition, we have a fuel crisis. We have to queue for a long time, sometimes for a whole day, to get our monthly quota of one gas cylinder. In the black market, it is very expensive."

Suddenly Karimha got up and went inside a room and got a sack which was marked "50 kgs". Pointing at it she said, "The last portion of my savings was finished in order to buy this sack of rice. It cost me 200 dinars."

The force of circumstances has, in more ways than one, alienated the women from their earlier sources of income. Many stories such as those of Siham and Wahida confirm this fact.

Siham lives in a small town called Safwan on the border of Kuwait and Iraq, with her seven daughters and her husband, a retired school teacher. Presently, the only source of income in the family is her husband's pension. He gets 200 dinars. Siham said,

Before the war, I used to supplement the family income by sewing clothes. But now there are no orders. There has been no work ever since the war started. Due to the strategic position of Safwan, most of the people got scared and fled.

When they came back, they found their houses looted and damaged. People do not have money for food, who can afford new clothes?

Wahida has a similar story to tell. She is a fifty-five year old widow from Zakho, a town in the northernmost tip of Iraq, bordering Turkey. In the course of our conversation with her, she remarked,

I became a widow when I was twenty-five. Since then I have been a seamstress and this is how I raised my children. But now, for the first time, there is no demand. Moreover, in my family we needed money urgently, especially as my two sons are unemployed, and so I had to sell my sewing machine. For the last two months, I have as a cleaner in the newly opened UN office. However, being a cleaner, I find that I have less status, than I had as a community seamstress.

Unlike Wahida, most women have been unable to find new jobs to replace old ones. This has increased the vulnerability of these women and made them more dependent on their families or neighbours.

Many anonymous women in Iraq today are driven to take up humiliating ways of earning in order to assure the survival of their dependents. They have had to compromise with the traditional notions of honour and shame. These include women who can be seen begging at street corners, hidden completely in the anonymity of the abaya (the traditional black garment covering the entire body), with hand outstretched.

Women respondents in the city and villages around Mosul, in the Governorate of Nineveh in north Iraq, admitted that they had heard that prostitution had increased in their own city as well as in Baghdad. This fact was corroborated in a conversation with an official in the Ministry of Trade in Mosul who said, "Social problems have increased. Morality has declined. People are selling themselves to feed their families." He was, it seemed, referring to women.

Verbal reports also confirmed such occurrences in Basrah. However, among the respondents to whom we posed this question indirectly, a majority said that they had not heard of any incidence or increase in prostitution. They said that they are sharaf (self-respecting) and would rather die than contemplate such an action.

4.1 Financial Crisis

"For ten years during the war with Iran we have felt nothing. But after two months in the war with Bush, we are suffering like never before. Every day is getting worse. I have sold all my gold jewelry, including my wedding ring.

This was not enough so we sold our furniture and kitchen utensils. Even our water tank had to be sold. This too was not enough. So my son borrowed 1000 dinars two days ago."

Majida Hamid, 60 years
Baghdad

Almost half (48 percent) of our respondents have incurred loans, and 55 per cent have sold gold jewelry and other household items such as refrigerators, televisions and furniture as a result of economic need.

We found that the first item to be sold was always the woman's jewelry. In Iraq, gold is given to every woman upon marriage as dowry. It guarantees her social status and her financial security.

A woman's gold ensures her involvement in decision-making in the household, especially if she is required to use it for any sort of investment.

The fact that women are forced to sell their gold due to the economic crisis within the Iraqi household, is a telling indication of the extent of poverty in the household. Most of our respondents reported that they had sold the gold for buying basic items. As one respondent put it, "I sold my gold to buy wheat-flour for my children." As often happens in periods of crisis, she was not able to get the value of the gold as per the market price.

Besides meeting basic needs, we found that distress sales were also made in order to raise capital to assist the setting up of petty trade or business for relatives demobilized from the army, prisoners of war who have returned, or those who are seeking to be self-employed. However, many Iraqi families have used up their resources.

4.2 Food and Subsistence

"Every waking moment I worry about how will I feed my eight children. It is the hardest thing for a mother not be able to feed her child."

Saeda Bani Dana, 32 years
Bartella, Mosul

"We never eat meat anymore. The last time we bought meat in our house was a month ago when a suitor came to ask for my daughter's hand. We cooked chicken for him. He and his family ate it all and the marriage did not even work out. The next day we had chicken-bone soup!"

Siham Al-Kader, 48 years
Safwan, Basrah

Food has become the main preoccupation of most Iraqi women. The food consumption pattern of the Iraqi family has been severely affected. The two main sources of food are the government food rations and the open market which is often called the "black market."

After the economic sanctions were imposed, ration cards were issued by the Iraqi government to each family. Under this scheme, each family member is entitled to a identical monthly ration of basic food items, including wheat flour, rice, sugar, tea, and cooking oil. Occasionally, a few other items like lentils, dairy products, and razor blades are also distributed. The public distribution has become the life-line of a majority of Iraqi families.

On an average, the rations last for 10 to 15 days each month. For the rest of the month, people have to rely on market purchases for their needs. The price of food commodities has increased 15 to 20 times on average since August 1990, while the price of wheat flour has increased nearly 50 times.

Many families have become totally dependent on rations and charity for survival. This is especially the case in households headed by women who are widowed, divorced, and abandoned.

Considerable variations are found between the south, the north and central regions of Iraq with respect to food consumption.

The south, especially Basrah, is the worse hit. Currently most families in the south subsist on bread and sometimes seasonal vegetables like okra, tomatoes, potatoes and eggplants. In many households, meat was last eaten before the war. In some areas even drinking water has to be bought at high prices.

In Baghdad, there are variations. In some households, basic necessities were found to be accessible, even though dietary habits had changed. For instance, home-produced bulghar (cracked wheat) and seasonal vegetables are an important part of the diet. In other low income areas like Saddam City, the situation is just as bad as in the south. People subsist on bread and occasional vegetables, and the consumption of meat, which used to be once or twice weekly has ceased.

The picture in the north differs. On an average they seemed to have fared better. Many of them have agricultural land which has helped their subsistence. Bulghar (cracked wheat) is home-produced and as a result is often used instead of rice. However, the condition of the low-income groups in the north seem to be as poverty stricken as in other parts of Iraq.

As for the Kurds, their food consumption was adversely affected during their flight to the mountains. Women interviewed stated that they lived on boiled water and bulghar until the emergency relief arrived. After two months in the mountains, thousands of Kurds still live in refugee camps and scattered shelters. Those who have returned have found their homes and property stolen or vandalized. Today, although the situation has somewhat improved, malnutrition is still common, especially among children. This is partly because, in many pockets of the Kurdish areas where the government is not in full control, the ordinary food distribution system does not function (UN-led food distribution has only partly compensated for this loss).

In general, it was found that food-related worries had become the main subject of interaction between women. This is because the management of food within the household is women's main responsibility. Their helplessness weighs heavily on them. It was interesting to note that most of the women's awareness of international politics towards Iraq was sparked by the economic sanctions, which the women perceived as the root cause of their plight.

"I am a widow with 7 children. I receive my late husband's pension of 100 dinars per month. I pay 70 every month for rent. I used to sew for my neighbours but now nobody is sewing. My daughter was killed by the allied bombings of Basrah. Now I take care of her two children because their father is a soldier. The landlord wants to throw me out. He comes twice each day to threaten me. He says he wants to sell the house or rent it for more. I have sold everything I own. What can I do - sell my children?"

Kamila Ali, 40 years
Saddam City, Baghdad

5 HEALTH AND SANITATION Health and sanitation are perceived to be in the concern of women. They must tend to sick children, look after the hygiene of the household, and secure water.

Previous studies on the health impact of the war and the sanctions have pointed to the public health catastrophe that Iraq is currently facing. While focusing on child health and malnutrition, none of the studies have specifically highlighted women's health. Although not health specialists, we nevertheless made an effort to determine the impact of the war and the economic sanctions on women's health and on their roles as the health caretakers within the family. This was accomplished through women's firsthand testimonies, and interviews with female doctors.

Most Iraqi households visited had access to health care facilities within 5 kilometers. In 1986 it was estimated that 97 percent of the urban population and 78 percent of the rural population had access to health services. The extent of these services vary in different locations. Some have comprehensive health programs including full-time doctors/mother and child health centers. Others have part-time doctors and less extensive services. Only a few respondents (one of whom was from a semi-nomadic family) reported a complete absence of services. Others complained that available facilities were inadequate.

5.1 Child Health and Women's Roles

"Just take a look at this child. They told me his mouth is infected but gave me nothing to treat it. Now he just cries all day long."

Zahira, 39 years, Karbala

Of the women interviewed, 49 percent stated that there was an increase of illness among their children and among themselves. The same observation was made with reference to the neighbourhood's children. Common illnesses are primarily diarrhea, typhoid, and in some cases malnutrition. Cases of infant deaths were also reported. This was especially the case among the Kurdish families, many of which suffered child deaths during their stay in the mountains.

Children suffering from diarrhea were found in most households visited. Women expressed concern and were aware of the serious consequences. In these cases the women had the burden of acting as the health caretakers. In the pediatric ward in both Babylon and Dohuk hospitals, it was common to find dehydrated children. The mothers usually stayed with their children in the hospital.

One mother in Dohuk hospital said that when she took her child to a nearby health center there was no medicine available for diarrhea. The child's condition worsened and after two days she brought her child to the hospital. This is a typical case where either health centers have been incapacitated due to lack of medicines or have been temporarily closed. The private sector has ceased to be an alternative for many families since they cannot afford the high cost of medicines.

Another mother in Babylon hospital, whose two month old son was malnourished and was suffering from marasmus (severe protein-calorie malnutrition), indicated that her rural family ignored her concern for her child; until one morning after severe diarrhea she convinced her husband to take them to the hospital. She had not returned home since.

5.2 Women's Health

“Most women suffered terribly from trauma of miscarriages during the war and the disturbances. Many could not find medical treatment at the time and have continuing problems with their health. Effective treatment seems unavailable for most women. A doctor friend of mine estimated that 7,000 women had miscarriages because of shock in Najaf alone.”

Alia, 21 years, Najaf

Dr Liela Abed El Amir, head of Babylon Pediatric and Maternity Hospital expressed her concern for the women's health situation. Most female patients in the hospital, she stated, are found to be anemic due to lack of proper nutrition. The incidence of miscarriages, premature labour and low birth weight babies is very high compared to before. Dr Abed El Amir stated that this might be due to physical and psychological pressures, lack of medicines or needed pre-natal care, or difficulty in reaching the hospital due to transportation problems.

Only emergency operations are being performed. The hospital's average number of operations per week was 200 before the war. Now it is around 50 operations per week. Many cesarian operations are being performed with the minimum of anesthetics.

The head of the hospital also expressed concern at the lack of contraception. Due to scarcity and legal restrictions, contraceptives are given only to women with medical needs and in rare cases to older women who have had many children. One hospital patient we met, who had had her second cesarian in one year due to lack of contraception, was anaemic and in generally weak condition. We also met a teenage girl who had a bleeding problem that could only be controlled by the birth control pill which could not be found at the time.

A woman gynaecologist from the town of Hilla claimed that there was an increase in illegal abortions. Although she did not state the number, she claimed that she was aware of several maternal deaths that have resulted from these abortions. Poverty was the reason for most of these abortions. Poverty was the reason which motivated most women to abort. Often the husbands encouraged their wives to abort, fearing that they could not financially support another child.

Among the respondent in our sample 57 per cent of the women claimed that they are suffering from health problems caused by physical and psychological hardships. A significant example is disturbance in menstruation. A large number of women stated that they and or their daughters have had irregular menses or excessive bleeding or severe pains. Other problems cited were hair loss, skin problems, or other psychosomatic symptoms such as insomnia and weight loss.

In one household visited in Najaf, the mother of ten children was ill in hospital. The husband who was in a desperate situation due to his wife's illness and lack of employment was eager to talk. He said that his wife was under so much stress and fear that in the end, her body just collapsed. The neighbouring women were taking care of the children. He commented, "By God, if I can return my children to where they came from I will". This statement gives an idea of the chaos that ensues in a mother's absence.

The availability of medicine was another major concern among the women especially those with permanent health problems such as diabetes, rheumatism, or high blood pressure. Among the women interviewed, 61 per cent thought that medicine was scarce and, if available, unaffordable for the average household. In cases of illness, women consulted with each other on home and herbal remedies. One such medication used for diarrhoea was dried lime with tea.

5.3 Water and Sanitation

"During the war our whole house was flooded with sewage. Even our kitchen. All of us were cornered in the back of that room. For almost 2 weeks we stayed there. We had nowhere to go. We did everything there. Cooked, ate, slept."

Um Mohamad, Baghdad
Size of Household: 19

On the whole women are responsible for securing water for their families. In every village or town women can be seen waiting for the arrival of water tanks or lining up at communal taps. Although most water distribution and purification facilities are operational now, supply is irregular, and not all parts of Iraq are covered. In the predominantly Kurdish north, for example, refugees in camps located near the Iranian border survive on newly dug wells, the water of which has been found to be contaminated. This was observed in the refugee camps of Saed Sadeq and Penjwin. In the south, many villages must buy their drinking water from water tanks which are not only expensive, but often contaminated.

In many areas, raw sewage is discharged untreated directly into the Tigris, Euphrates, and other rivers. In general, families do not now depend on the rivers for drinking water as was the case during and immediately after the war. However, many people still depend on the largely contaminated river water for other household uses. In many neighbourhoods, raw sewage had backed up into homes and streets as a result of the malfunctioning electricity and sewage systems. This was especially observed in Basrah and in some areas of Baghdad. Many families who had relatives elsewhere, left their homes to escape sewage overflow and disease. Others, with no place to go, stayed behind. The women did their best to clean their homes, only to find that sometime the sewage resurfaced.

Another health problem after the war was garbage collection. During the bombings, there were no garbage collection services and people could not dispose of their refuse properly. Now, although such services are slowly returning to normal, in 41 per cent of the households visited it was still a major problem. This was particularly true in Basrah. In such areas, only a few women stated that they burn the garbage. Many dispose of it "somewhere far from home". Others just throw it behind their homes. Children were often encountered playing in the heaps of garbage; they would say they were looking for things to play with, such as wood and cardboard.

6 SOCIAL ASPECTS Arab society is characterized by a strict division of labour between the sexes. Women's domestic responsibilities confine them to the home and the family, while men are expected to go out and earn a living. Even working women retain the full burden of domestic responsibilities.

In the last ten years, many of the Iraqi men were drawn into the army. Women were left entirely responsible for the household, which often includes elderly relatives and young children.

After the Gulf War many of the men who had been in the army for the past 10 to 12 years were released and found themselves unemployed and without any income. This has had a direct bearing on the women in terms of being able to provide for their families and in terms of their marital relations.

6.1 Women's Domestic Roles Almost all women claim that their lives had changed since the Gulf War. They usually compared this war to the Iran-Iraq war, during which the impact within the household was minimal according to most women. Of the 80 respondents, 80 per cent mentioned that they had extra domestic responsibilities due to the destruction of infrastructure such as water supply, electricity and fuel shortages.

Most women started to bake their own bread after the war, as buying bread had become too costly. Many of them have to gather firewood daily in order to bake and cook, since gas for the ovens is also expensive. Women also have to plan and ration their food so that it is enough for the month. They have to be aware of market prices and of what is most cheaply available.

Some creativity is required in cooking since the women are obliged to use limited ingredients. For example some women said that they added barley to their bread so that it is more in quantity. Whenever the women receive "black" (unrefined) flour from the public distribution system they mix it with some white flour from the open market. In periods of severe shortages, women, especially from Basrah reported how they bake the left over unrefined flour in the sieve. This flour in normal times would be used only to feed the cattle. Others said that they now pick some wild edible green leaves to use as soup.

When asked how they would divide their limited supply of food in a household, which included children, pregnant women, the old and adults, women were unanimous in the view that the children would be fed first. Often mothers reported that they went hungry and gave their share of the food to the children. Priority to pregnant women was given in very few cases.

Water is another major worry now and its acquisition differs according to different locations. While in some rural areas women are used to fetching water from wells or rivers, many Iraqi villages are in fact equipped with water pipes. Fetching water became an added responsibility for many women after supplies of piped water were disrupted.

Some households now have nearly-regular water supply, after at least three months of erratic delivery. In some areas such as Basrah, water supply is still erratic, with water being available for as little as an hour each day. During this hour the women fill up as many containers as they can and perform all their washing and cooking.

In the rural areas south and north of Basrah, water is bought from tanks or supplied free by organizations such as the International Committee of the Red Cross. The women in these areas have to carry large water containers and stand in line for hours before carrying the filled containers back home. By mid-August most women were no longer heavily dependent on river water, which had been a main source of water supply since mid-January.

The safety of the water is questionable and a few women do boil their water. However, in such cases of scarcity the availability of water is the issue for most women and not its safety.

Women's constant worry about food and household management in such a dire situation leaves little free time, compared to before the crisis. Women stated that they socialized outside their home more often before the war, or engaged themselves in such things as sewing. According to 46 per cent of the respondents, there is now less time for leisure. But, as many women put it, "the matter is not a question of time as much as the troubled state of the mind".

6.2 Women's Inter-Family and Community Relations

“We went to the neighbours house during the war. Their house was safer. It was like we were one family. We shared our food and our water. We were so scared we all stayed in one room and did not move for days.”

Abisa, 40 years
9 children, Kerbala

“When we fled to Turkey it was very difficult to get food. All the younger men ran fast and got all the food the Americans were handing out. We only had my husband with us and he can't run - so we ended up as a family without food - this happened to all the women who fled without their men - we were just left out - as if we weren't there - three of my grandchildren died in those mountains.”

Fatimah, 68, Amadia (Dohuk district) returned
Kurdish refugee

“Every woman I know in this town fights with her husband or son on a daily basis. They have no work and they are in the way. When they go out of the house they spend the little money that they have on coffee, tea or some beer, so that's not the solution either. Our men need jobs and we need a break.”

Um Faris, 46,
Karameles, Mosul

Women's added responsibilities are largely seen as their duty. When asked whether they have more responsibilities than before, 80 per cent responded affirmatively. When asked whether these responsibilities are more than the men in the household, 74 per cent of the women responded that this was natural. When probed further whether this was appreciated by the males or the rest of the family the women reacted in a surprised way and largely did not give a clear answer.

On the question whether there has been an increase in marital problems after the war as a result of increased pressures, 17 per cent of the women related such cases. However, they were rarely open about these matters. Some women expressed the view that their husbands were more nervous, and said that whenever the women or the children approached them regarding any of their needs, they would scream and leave the house avoiding any answers. Two women, whose husbands are unemployed and sit idly at home or in the coffee shops said that whenever they approached their husbands and urged them to seek work more actively, the husbands threatened them with a second wife.

In fact, marriage is increasingly becoming an issue in the Iraqi houses visited that had daughters of marriageable age. Iraqi society is a married society. In 1987, 50 per cent of Iraqi women above the age of 12 were married (see **Table 2a**). One twenty year old woman from the Marshes in the south expressed her concerns, “Some of the eligible young men were killed and many others have left. The only ones who stayed are the children and the old people.”

The fact that many young women remain unmarried is largely due to economic reasons. Young men are mostly unemployed and their families cannot provide for them as is traditionally the case. Marriage customs include a dowry given to the bride, mainly of gold jewelry.

When asked why young women did not compromise on their gold dowry, several mothers expressed their concern that in that case their daughters would not have a good social standing among their new in-laws. There are also rumors, especially in Baghdad, of instances of divorce in cases where the bride's family supports the newly-weds

Community relations with neighbours have solidified during and after the Gulf Crisis. Sometimes neighbours would move in with each other if they found one house was safer than another during the war and the ensuing civil disturbances.

Women stated that their relations with each other were very important to them during the war. They shared their fears and worries with each other. Besides helping one another with food stuffs and medicines, they stayed in each others' houses or shared rooms in the shelters. After the war they fetched water together from the rivers or stood in line together for their monthly rations. Those who did not know how to bake were taught by the neighbours. Often one tanour (oven) would be shared by many families.

Only in the case of the Kurds was this not the case. Social solidarity was, however, more fragile among the Kurds, perhaps due to the extreme hardships they experienced.

7. PSYCHOLOGICAL IMPACT The society as a whole, today, gives an impression of despondency and fatigue, aggravated by the fact that it has just come out of an 8-year war with Iran. Life seems to have become a struggle for survival for every Iraqi individual. As one woman asked, "Till when will the sanctions continue? We are tired. We want to go back to what we were before the war."

Of the women respondents, 39 per cent said that they feared that members of their family either at home or in the war front could face danger. Forty-seven per cent said that they left their homes for the provinces or cities fearing bomb attacks or other forms of war violence. Those who remained behind were often the very old, those who could not afford the expenses or those who had no place to go.

"To hear the bombers flying over your house was almost unreal. In moments of fear, you pretend that it was all over and you are already dead looking at the sky from your grave."

Um Jassim, 45 Basrah

Many women (60%) felt that they were suffering from psychological side effects as a result of the war and the sanctions. Most of them related symptoms like depression, anxiety, insomnia, weight loss and health problems such as with menstruation, high blood pressure or increased smoking. Many pregnant women miscarried and others could not breastfeed.

"I dream about Samir all the time. I see him as a grown up. I dream of him on his wedding day or in his army uniform. The doctor has written a letter to my employer saying I need a sick leave because of psychological problems (depression). But when I sit at home all day I remember Samir even more."

Um Samir, 25, Baghdad mother of 9 year old who died in the Ameria shelter bombing and an Iran-Iraq war widow

"From terror my two daughters-in-law miscarried during the war. One was 3 months pregnant and the other was 7 months pregnant."

Jamila, 39 years
Amirieh, Baghdad

Respondents believed that the war has had a psychological impact on their families especially their children (73%). Of these, 46 per cent claimed that their children had bad dreams and had problems sleeping. It was often found that women tended to worry about the situation of their children and spouses more than themselves.

"My eldest son Mohammad (22 years) has not been normal ever since he came back from the war. He has lost weight and is very irritable. I hear him walking about in the night. He is also being very rough with his wife. My elderly mother is also having trouble with her sleep. She says she prefers to sleep in the day because it is safer."

Um Mohammad, Saddam City
Baghdad

Iraq being a traditional society, most women refused to answer questions pertaining to the issue of increased moral problems, like sexual harassment of women or increasing prostitution. Some respondents expressed anxiety about the safety of their daughters. One respondent in Amara described the anxiety that

she used to feel for her daughters during the civil disturbances in the south. During that period several rape cases were reported. Consequently, she sent her daughters to Baghdad only to realize that it was not safer for them.

The future expectations and aspirations of the women reflected their psychological distress. Almost all women believe that the war and the sanctions have brought permanent changes in their lives. Forty per cent of the women said that they are living one day at a time. Another 41 per cent are pessimistic about the future, especially because of the continuation of sanctions. Only 19 per cent of the women were optimistic about the future – mainly because they believe that things cannot get worse than they are now.

“Even if I was to wish anything, it would not come true. All I want is a nice home and a good living. That is all.”

Salima, 27 years

“Life was better before, but things cannot get worse. They have to get better.”

Ramla, 33 years

8 CONCLUSIONS

After viewing the situation in Iraq from the inside, one has a closer understanding of the human consequences of the Gulf Crisis.

The following is a summary of the most salient findings:

1. The Gulf Crisis has on the one hand, forced the women to adopt roles and responsibilities traditionally assigned to men, and, on the other hand, made their own role harder to fulfil.
2. From the point of view of Iraqi women, the most serious consequence of this crisis is their greatly reduced ability to feed their families. Hunger is the foremost preoccupation among low-income groups in Iraq.
3. Impoverishment has led households to sell their assets, beginning with women's jewelry. This has increased the women's dependence and vulnerability. In the worst cases, women have been driven to begging and prostitution.
4. Women's physical well-being has been greatly reduced not only through economic hardship but also due to the lack of medical care and clean environment.
5. Women have suffered from psychological and emotional stress, including the trauma of bombings and internal disturbances, the loss of loved ones, and constant anxiety about the well-being of the family.
6. Social life is another casualty of the war. Iraqi families are so dispossessed and demoralized that they cannot celebrate marriages, welcome guests or enjoy any kind of social entertainment. Women's mobility has been greatly reduced by fear of sexual harassment and theft. Women frequently express these social losses in their testimonies.
7. Marital problems are reported to have increased as a result of economic and psychological pressures. Women, due to their physical and financial powerlessness, are the primary victims of increased discord.

The basis of the Iraqi society, the home, has been held together by women's ingenuity and strength - despite their own economic, social, emotional and psychological deprivation.

CASE STUDY 1: FADDILA “Every night we sleep hungry”

Faddila lives in a poor neighbourhood called Karamad, a few kilometers from the city of Mosul, in the governorate of Nineveh. This neighbourhood, a working class area, is one of the poorest districts in Mosul.

We first saw Faddila when we were interviewing her neighbour. We asked Karimha, the woman we were interviewing, who she thought was the poorest household in the neighbourhood. She promptly answered, “It is Faddila. I have never seen anyone who suffered more.”

We went to Faddila’s home, which is two doors away from Karimha’s. Her home consists of one room and a kitchen. This is part of a larger house where several other families live, with rooms surrounding a shared central courtyard. Faddila’s home was neat and clean. A flowered curtain covered one wall; a wall-hanging with an Arab design covered another. Mattresses were neatly piled on a wooden rack, and from the nails on the wall hung a few clothes.

Faddila is thirty years old. She was married in 1981 and eight years later she became a widow. Her husband was ill for six months. He had cancer. They took him everywhere for treatment, but he could not be cured.

After her husband’s death Faddila was faced with the task of raising her four young children on her own. Her husband’s family did not want her nor did her own family. “This was my naseeb” (fate), she said. Karimha added that the reason why Faddila was regarded with disfavor was because she was a Christian-Arab married to a Kurdish-Muslim. “He used to live in the same neighbourhood as we used to. He was a good man,” added Faddila with a sigh. Did she think of getting remarried? “No, there is no question of that for I have to look after my children,” she said.

How has she been able to survive in the past few years ? She replied, “I am able to survive only because of other people’s help. I get 54 dinars a month from the government.” A similar pension is given to all widows (excluding war widows who are covered under a separate program) for as long as they live.

“I started working as an office helper. But was able to do this for only 15 days. I decided to leave, because when I came back home I used to find my little boys on the street. How can I work when my children are so young? If the children grow older, then I will do some work.” We asked her why she said “if”; she replied, “My children grow so slowly, it is as if they do not grow at all.”

“In the past, with 54 dinars, I used to be able to manage very well. Now I am not even able to feed my family. My small child wants some meat. What do I tell him ? When some other family cooks meat, my children sit and cry. In the past few weeks, there have been times when I was not able to get any food for my children. Every night we sleep hungry. I do not have any cooking oil. The other day, Karimha’s mother gave me some and I cooked with that. Also yesterday she gave me some food. If we have some bread we at least can eat something.”

Karimha said that she had never seen anybody so hungry. “I sometimes come to her house and find her crying.”

Faddila continued, “During the war, everybody left. I could not leave. It was cold. We would sit in our one room and cough. Karimha’s mother and father used to feed us. Even though the whole household had left for a village in the north, the old couple preferred to stay back in their own home. We used to sometimes go and sleep there.”

Karimha scolds Faddila because she has lost her ration card. Now she will not be able to get her rations. Once lost, a ration card is not reissued. Faddila hopes that she will be able to find it. She has been getting the supplies every month. This government ration lasts her for 10 days. Faddila and her four children often go hungry during the 20 days that remain each month. Faddila is never sure that her children will get food the next day. She is able to buy from the open market only if somebody gives her money. “In

the remaining 20 days, people give me half of what I get from the government. Sometimes friends like Karimha come and cook for me or share their meal with us. At other times we are able to get leftovers from other families, or we just go hungry.”

CASE STUDY 2: FATIN

”How long will the sanctions continue? We are tired.
We are innocent.

As the taxi stops, we are informed by our driver that we have reached Mishrag, a poor neighbourhood of Basrah. We pick our way through the debris. In front of us is a narrow path, thick with the water of an open sewage. Some open space is littered with stones. On the left hand side we cross an old woman, bent over, looking carefully through the floor of a house which seems to have fallen apart, and picking up a few items of use. There are small houses on either side.

We knocked on a door. A young girl opens it and after understanding the purpose of our visit tells us that we are welcome although her mother has gone out to fill water. We notice that several women and young girls are coming from the distance carrying buckets. We decide to wait for her mother. A few neighbours come in and general talk follows. Soon it becomes apparent that they think we are a health team and that we have come to distribute milk.

We sit down together on a carpet, under the date tree, in the courtyard. In front of us is one room. We are leaning on the wall of another. A narrow passageway on the left of the room in front of us leads to the front door. As dusk falls, we can hear the traffic from the main road close by, cries and the running feet of children. Through the open door, from time to time we see women and young girls passing by carrying water or hurrying with empty containers.

This neighbourhood seems to have all the characteristics of a slum. Open sewage, lack of sanitation, water difficulties, malnutrition. And as one woman points out “breasts without milk.” As soon as Fatin, the mother of young Alia returns and frees herself from the water load, she sits down with three year-old Arij, her youngest, who is very obviously expecting to be suckled. Alia, without being asked, takes up the empty bucket and rushes out.

Fatin is in her late 30s. Slim and of medium height, she has a pleasant manner about her. When she hears about our visit, Fatin remarks, “All our sufferings are due to the sanctions, sister. How long will the sanctions continue? We are tired. We are innocent.” Other neighbours join in with similar observances. We ask Fatin to tell us more about her family.

“I was born in 1953. I have been married now for twenty- one years. I am a grandmother,” she adds with a smile. “My eldest daughter, 20 years of age has one daughter. The second daughter who is 17 is also married. Like me, both of them received only their primary education. I have six other children. Harith, 14; Alia, 12; Khansa, 10; Ali, 8; Amar, 6; and Arij, 3. Except for the two younger ones, all of them go to school. The school is nearby. It is free though we have to provide for the children’s clothes and stationery.” At this moment, one neighbour points out that one metre of cloth required for the uniform costs 15 dinars. “Today, we do not have money for food sister, how do we provide for clothes?”

“Most children go to school. Some can’t go because they have to work instead. Some children who go to school also try to do some work - depending upon the family’s needs. Most of them sell merchandise, like Pepsi, on roadside stalls. Some of them are apprentices with mechanics.”

Do Fatin or any of her children work? Fatin replies that they do not. She continues, “My husband was a driver in a government establishment. He worked there for 15 years. He has now been retired for two years and is jobless. We survive only on his pension which is 110 dinars a month.

“This house is ours, Allah Karim ! If we were to pay rent for such a house, it would be 60 to 70 dinars per month. But we do not own the land on which it is built. We came here, 20 years ago, when my husband got this government job. We were living in Abu Al Khasib, south-east of Basrah. We bought it from the family which had first built it. Seventy years ago, it was open land and anybody could build here. When people first started building here there were only mud huts, construction followed later. There are now more than 100 houses here but since the land belongs to the government, we can be removed anytime. In the neighbouring area, the government has offered compensation, 8000-9000 dinars depending on the

construction. The government wants to build roads. We have heard that they want this house too. Therefore, we intend to go soon. Bad times have struck us during the last one year.”

“During the war, all of the bridges were bombed. All the roads were cut off and no food could reach us. We started dividing our food into smaller portions. One piece of bread would have to be divided into eight pieces to feed everybody.

“We used to go and get our food rations while bombs were falling around us. Even though the government gave us food rations, during the three strife-torn months of war and internal disturbances, food was always short. If we were careful, the food would last longer. When it ran out, we had to buy from the open market. If I would normally cook one kilogram of rice for the family, I started cooking much less. I would have to go hungry myself in order to feed them.

“Since the beginning of the sanctions we have not tasted chicken or (any) meat - only flour, rice and sometimes vegetables. Our children have developed anemia due to lack of milk. Before, 24 when I would watch an Egyptian programme on the T.V., and hear an Egyptian say, “We are having meat for lunch today. It’s an occasion,” I used to laugh. But now I know that it is no laughing matter for our own turn has come. When my husband was a government employee, we could buy fish and meat from the co-operative stores at cheaper rates. But not since he retired. And now we have the burden of the sanctions. War is over now. Why are sanctions continuing?”

Farin was asked it in spite of trying so hard, did she still feel that there were times when her children went to bed hungry? Fatin answered promptly, “I would buy food however expensive. I would never allow my children to go hungry.”

However, this was apparently not the case in all families. A neighbour commented, “I went as far as baking the leftover flour in the sieve to feed my children. In normal times, this is good enough only for the cattle. There were times when we did not have even that.”

“When the food was short, I would feed the children first and then we as parents would eat,” said Fatin. A neighbour said, “I had a child at home who is two years old, for whom milk was not available. So even though I had a pregnant sister at home, we had to give priority to the child and not to her.” Another neighbour said, “I would feed the youth first because they consume more.” Fatin pointing at her palm continued, “If I would have bread this large, which would be my portion, I would cut it into pieces and divide it among my children - for their own portions would never satisfy their hunger. I would survive on dates and sometimes tomatoes. All of us became weak. Especially the old and the ill who had to do without any special care.

“During the riots, the prices of basic vegetables like potatoes and tomatoes increased three times. I sold my gold and also a refrigerator. I sold it to feed the kids.” Another neighbour whose husband was a prisoner of war and taken north, said, “It was very difficult to sell my husband’s wedding ring, but I did it anyway.” Fatin continued, “In addition I owe people 300 dinars. People who are a little better off lend money to others.”

What were their experiences during the war? “We experienced khauf, jua au raob (fear, hunger and terror). During the day, we would not fear the airplanes only during the nights. Some people stayed on here. We returned to Abu Al Khasib because the water supply was cut off. People were drinking the river water which was salty and dirty.”

Along with Fatin, there were six other women sitting in the courtyard. “During the war and the riots, for three months we did not have a drop of tap water. We used to collect rain water, wait for all the particles to settle and then drink it. We were completely dependent on the matar au nahar (rain and river). The river water had insects in it. We suffered a lot of problems. Our children had problems. Since the river is a tributary of the Shaat al Arab waterway, it is saline. During the war, the whole neighbourhood would gather so as to get the water together. In one day we would have to go 6 to 7 times. A week after the riots, power supply and piped water was resumed. The quantity of water received is good but we feel

that it has not been purified. Since we have taps in all our houses we receive water at our homes but today, since the water pipe has broken down, we had to go across the road to fill water.”

Aren't you able to boil the water, we asked. “We boil water only for infants. We need so much drinking water for the whole family. If we would boil water for all, we would need a lot of fuel. Moreover, if we boil the water it tastes more salty.”

We left the women continuing to talk amongst themselves about the lack of electricity for three months and the shortages of gas and fuel. Fatin said, “Even today, we have to rely very heavily on firewood.” Her neighbour added, “Bush said that he would never strike at a residential area, but look what is our condition. When he was throwing bombs at us, we were baking bread!”

Fatin added, “We don't fear bombs as much as we fear hunger.”

CASE STUDY 3: UM MOHAMMAD

“All my life I was never sick. Now I am always sick. Look at my face, it is so thin now.”

Um Mohammad lives with her husband, her husband's first wife, her mother, her 4 daughters, her 7 sons, a daughter in law and two grandchildren. They live in four rooms that are joined by a courtyard in a low income neighbourhood of Baghdad called Saddam City.

Um Mohammad, 40 years old, was married at the age of 17. Although Um Mohammad's daughter points out that her mother attended literacy classes for almost two terms, Um Mohammad herself says she is illiterate. Her husband Abu Mohammad is a retired policeman with a pension of 100 dinars per month. Although he was relatively young at the time of his retirement five years ago, he refuses to seek work and spends his time with relatives or friends in coffee shops.

Kamela, 55 years old, is the first wife of Um Mohammad's husband. As she did not bear him children he got married again.

Fatima, 22 years old is Um Mohammad's daughter-in-law. She was married at the age of 18 and has a son, a daughter and is pregnant with her third child. She attended school until the eighth grade. Her 22 year old husband is a soldier with an income of 150 dinars per month.

Um Hussein is Um Mohammad's mother, approximately 70 years of age. Um Hussein has been living with her daughter for the past five years.

The family's greatest misfortune during and after the war, apart from having two sons in the military, was the flooding of the sewage system in their neighbourhood. Um Mohammed said, “During the war, our whole house was flooded with sewage. Even our kitchen. All of us were cornered in the back of that room. For two weeks we stayed there, as we had nowhere to go. We did everything there - cook, eat, sleep.” According to Fatima, this was the cause of the recurrent diarrhea among her children and among her mother-in-law's younger children.

Apart from this, the family has been suffering from ill-health ever since the war. The most serious health problem concerned Fatima who had a miscarriage in February after a seven month pregnancy.

“I had not heard from my husband who was in Kuwait. My two children along with the other children of the family were frantic and very difficult to control during the bombings. We were stuck in that room because of the over-flooding sewage. We would clean it and it would come back, again and again. Then one night, I had severe pains. They called the local midwife as the health center was not functioning at the time. She told me that the child was dead already.”

Fatima is pregnant again. She is not receiving any pre-natal care. She explains this is because she has no time now, as compared to her earlier pregnancies in which she did receive care. As for her children who have not been immunized, she stated that this was because of the lack of vaccines in the local health center. When questioned about her young age and her desired family size she responded by saying that women should have children as long as they can and she will never consider family planning methods.

When Fatima left to see to the children, Um Mohammad explained in a whisper that ever since the war, Mohammad, her son, Fatima's husband, has not been “normal” and is being very difficult with his wife. She explained that he does not sleep well and has bad dreams, that he has lost a lot of weight, he is impatient with his children and very remote and uncommunicative with the rest of the family.

Um Mohammad has had a severe skin problem since the war. She was told by the doctor that it was psychological and that she should relax. He gave her ointments and some pills. The inscription on the medicine packet explained that they were muscle relaxants. Um Mohammad has also been having problems with her menstrual cycle. “All my life I was never sick. Nothing. Now I am always sick. Look at my face it is so thin now.”

As for Kamila, she complained of high blood pressure and diabetes. Her problem is not caused by the impact of the war and the economic crisis. However, it is being exacerbated due to the lack of available medicines. Apparently sometimes they can be found in the black market but at unaffordable prices.

Um Hussein has a permanent health problem as well. Her rheumatism is an increasing problem and her movement is getting harder. Medicines are also unavailable although she had, at the time of the interview, some pain killers given to her at the local health center. When questioned whether Um Hussein's increasing complaints and needs of more care posed a problem for the family, the answer was negative. In fact, it was observed that she was receiving a lot of attention, especially from the children.

Um Hussein added, "God forgive this man Bush. Now I cannot smoke normal cigarettes and have to smoke 'titin' (local raw tobacco) and I have a bad cough because of that." At this the whole family started laughing.

Kamila interrupted this laughter with a note, "One cannot hate the sinner when he is ignorant. Every person in this world has his own sins and only God can forgive him. This is why I cannot hate Bush." But Um Mohammad joined by saying, "Yes, but I cannot forget what he has done to us every time I try to sew my children's torn clothes over and over again. We are so poor now. We are hardly living." Kamila replied: "But this is written for us. We are to suffer."

Um Mohammad continued on how their lives have changed since the Gulf War. The water is never consistent. There is no current garbage collection services and their crowded neighbourhood is getting dirtier by the day. They have not paid any electricity and water bills for the past 4 months. Her husband is extremely irritable and is away all the time leaving them to deal with all the extra burdens and the ensuing domestic problems.

After this outburst Kamila had to agree for once with her co-wife. She stopped kneading and took a deep breath: "Ten years with the war in Iran and we felt nothing. Now after two months in the war with Bush and look at us."

The setting of the interview reflected the social organization of the female members of the household. A lot of responsibility seemed to fall on Fatima despite her pregnancy; she was the one to leave to see to the children and to answer the neighbours knocks on the door. She knew the exact changes in market prices before and after the crisis. She does the shopping and gets the family monthly allowances from the public distribution system.

CASE STUDY 4: UM AMAR

“We feel weak, but it’s not that we can’t go on...”

At the age of 35, Um Amar (meaning mother of Amar) has given birth to five children. Married at the age of 14, she is barely literate and has never had the time to catch up on the education she failed to obtain due to her early marriage.

Um Amar and her husband share their house with her husband’s three sisters, her father-in-law and her own father, who is blind. Her house stands in the middle of a working-class neighbourhood in the port city of Basrah in southern Iraq. Um Amar’s family, as well as the family of her husband, are natives to Basrah, the second largest city in Iraq.

In Um Amar’s family no one died during this last war, no one became permanently ill, and while temporary loss of income did occur for a period of 3 months, all the wage-earners are back at their jobs and earning some money.

At first glance, the situation is very normal and, to an outsider, the poverty in which her family lives most probably existed before the war.

But Um Amar’s story is less than straightforward. Four members of her household live on medication and she is personally responsible for feeding, cleaning and caring for three of them. Because her mentally retarded 20 year old son, Amar, and her 74 year old father cannot move easily, Um Amar and her family never left their house during the bombardment of Basrah.

The lack of water and electricity which resulted from the bombardments continues to a large degree even now and Um Amar’s task of caring for the sick under her roof has become much more difficult.

While her retarded son used to entertain himself by watching television, this is no longer possible because electricity is available for only 6 hours a day. “Before, it was not so difficult because Amar would watch television 10 to 12 hours a day and entertain himself this way. Now we have so much more to do and to entertain him as well - it is not easy”, she says.

Fadwa, Um Amar’s sister-in-law, is a midget and has been living with the help of medication for the last 54 years. While not acutely ill, she has health problems as a result of her condition. After the war Fadwa no longer was able to find the medication she needed to relieve her condition because drug supplies had been depleted in local pharmacies and no new stock was coming in. So, although Fadwa used to help Um Amar in the house, she now no longer has the energy to help in the cooking, washing and caring for the twelve residents in the house.

Um Amar’s husband, Abu Amar, was a prisoner of war in Iran for 7 years and was released during an exchange of prisoners. He still suffers from respiratory problems that he developed while in prison, but the medication that doctors say he needs is no longer available. Um Amar makes Abu Amar teas and herb drinks that she believes will ease his suffering.

Abu Amar is the family’s main wage-earner and brings home 150 Iraqi dinars every month from his work as a salesman. His sister Salwa is a teacher and earns 130 dinars. These two provide the sole income for the family of twelve.

Due to the enormous inflation, the family has not eaten meat for 3 months and survives on soups and dishes made from seasonal vegetables. While they do make bread, mostly from dark flour, milk and cheese have been absent from in their diets since January. Seven chickens provide a few eggs and when chicks hatch they kill them so that more eggs will be in supply.

Um Amar and her sister-in-law, Shamar, fetch water everyday, by bucket, from the Tigris river. Um Amar explained, “The water coming out of our pipes is not enough for us so we get some more from the waterway... I don’t know why the water from the pipes has become less but it just is not like before.”

Um Amar is happy that no one in her family was killed during the war and her family has been “able to manage” despite the difficult situation. Her two teenage children, Maha and Aris, are both in high school and she hopes they will get scholarships to go to university so that someday they may get good jobs.

Her daughter Maha, Um Amar says, should finish school and go to university so that she can one day help to support her family or the family of her husband.

Um Amar and Maha had irregular menstruation during the three months that followed the war. The two women also suffered from a significant amount of hair loss.

Only when asked if she has sold anything in order to meet expenses does Um Amar admit that things have become very difficult financially. In August she sold all her and her sister-in-law’s gold to raise money. She is not sad that she had to sell her gold, “It’s a security that must be used for emergencies and this was an emergency.”

While the whole family suffers from diarrhea, Um Amar considers that no one is really sick. “We feel weak but it’s not that we can’t go on. I think the water isn’t very clean these days and that’s why we have a lot of diarrhea!”

Um Amar says that she is lucky, she and her family own the roof that they live under and have incurred no debts and most important of all no family member died in this war as she feared they might.

CASE STUDY 5: FATIMAH

“The war is over but the worries and uncertainties remain”

In the northern mountain village of Al Amadia, perched fort-like on an isolated hilltop some 20 kilometers from the Turkish.

Fatimah is a member of a Kurdish mountain community that was greatly affected by the civil turbulence which occurred after the international cease-fire was announced.

She and all members of her family fled to the mountains of southern Turkey in an attempt to escape what they believed would be a massacre. What they found in the Turkish mountains, however, was hardly a safe haven - it was cold and hunger. Sixty-eight year old Fatimah's memories of her two dead grand-daughters and her 7 month old grandson will remain with her forever. But not only did she lose her grandchildren, Fatima's mother died as well. Her daughter, Suma, miscarried and her 90 year old father went blind. Her two sons had fought with the Iraqi army in Kuwait but returned unhurt. She remembers how anxious she was about their safety. “I used to dream at night about their return thinking that maybe they would not come back and I used to wake up petrified”. But when Fatimah's boys came back a new drama evolved. In a bid to achieve regional autonomy her two sons joined the Kurdish peshmerga fighters and, in fear of a possible standoff between the Iraqi government forces and the peshmergas, the civilian population fled to wherever it could go.

In the clean and orderly courtyard in front of her house, Suma, Fatimah's daughter, sits and allows her only remaining child, a girl of one and a half years, to play as she will. Fatimah's two daughters-in-law, who are members of her household, sit in silence while Fatimah and Suman tell the story of their plight.

During their three month ordeal as refugees fleeing north, Fatimah lost a lot of hair and two more of her teeth fell out. While Fatimah no longer has her menstrual cycle, her two daughters-in-law failed to menstruate for a period of four months. Since returning to their previous cycles of menstruation, the two women have been unable to become pregnant. While it may be too early to make such conclusions, Fatimah fears that “something has happened and they can't conceive anymore”.

After losing their children the two daughters-in-law are depressed and their depression is compounded by their inability to once again become pregnant. Without meaning to add pressure, the mother-in-law is encouraging both women to replace the lost family members with new children in order to once again revive the family spirit.

“Our only hope now is to have more children”, she says. While no one mentions it, it is known that in Muslim societies (which the Kurds belong to), a woman who does not conceive children is always threatened by the prospect of her husband taking another wife, which is legally considered his right if she fails to conceive.

The little income that the family now has comes from farm produce harvested from a small plot of family-owned land. While before the war Fatimah's family used to eat meat every day, they now eat meat once a week. This is a considerable problem, Fatimah says, especially since the men “like meat so much.” In fact in Fatimah's house, as in most of the households in the region, a meal without meat is not considered a good meal.

Most of the available foods in the market are either locally grown or supplied by western humanitarian agencies. This year's local harvest suffered greatly because of lack of rain and poor maintenance. For this reason agricultural employment is scarce and brings in less income than in previous years. Fatimah's sons now rarely have work.

Fatimah's husband is a retired former employee of the Iraqi government. He no longer receives his pension of 80 dinars because Kurdish demands for autonomy have severed most administrative and

political ties between the Kurdish north and Baghdad. Thus, the many Kurds who were formally employed by the Iraqi government, now have no jobs and also no pensions.

For these reasons, Fatimah also worries about the family's economic situation. She has many questions on her mind. How long can they manage? Will there be an agreement between the Kurds and the government in Baghdad - so that her husband can again receive his pension? Will the market be once again filled with many things as in the "old days"?

"The war is over", she says, "but the worries and uncertainty remain" - what tomorrow will bring is always on her mind.

CASE STUDY 6: UM SAMIR

"With the blink of my eye, I lost half my family. I just want God to save those who remain. They are my future."

Um Samir, called the "Mother of the Martyrs", by everyone in the community, lives in Aadhamia, a poor locality in Baghdad.

Her house consists of two rooms and a kitchen. A tree stands in the center of the courtyard. A broken staircase leads to rooms above, which are now dilapidated and unusable. As soon as one steps into her front room, Um Samir's story comes through. The room is small, with a bed and a small cupboard. The walls are covered with frames of photographs. Predominant among them are the photographs of two young men.

"I had seven children. Three died and four remain. My two sons, Samir and Raad died when they were 21 and 22 years of age. Both were killed in the Iran-Iraq war." She points at a picture of young Samir sitting on a military tank, laughing with his friends. This picture was taken two hours before his death, and was sent to his mother from the battlefield because he wanted to reassure her that he was fine.

"After Samir died, we moved to another area since we could not bear to live in this house. A year passed, and Raad got killed too. His body was brought to the police station. They came and informed his father that our neighbour had lost his son. It is a regular practice to inform the nearest relative or neighbour and not the immediate family. Since they had not told him before, Raad's father dropped on his knees with shock when he found out that he was in fact looking at the body of his own dead son. Soon he developed a heart problem. He never really recovered and one year later he passed away. He was 51 years old."

"In the same year I lost my three year old daughter too. She had been brought up by her two elder brothers who loved her dearly. Once I took her along with me when I went to visit their graves. She seemed to be emotionally affected by the loss. She developed an ailment and died, when her father was still alive." Um Samir points to her little daughter, Fareeda, in a photograph where she is seen between her two brothers.

"I have two sons left. One is still in the army, up north. The other works in an office in Baghdad. One of my two daughters is married. But her husband does not allow her to visit me. During the Iran-Iraq war he had first deserted her and then divorced her. She lived with me for four years afterwards with her four children. She was receiving an alimony worth 110 dinars from him. At the end of the four years, he made up with her but we have lost her since then."

"In this house, there are now two of us: my youngest daughter, who is 12 years old, and myself." Without any earning member in the household, how does she survive? "On God's mercy," replied Um Samir. "I receive a pension for each son I have lost. For one, I receive 80 dinars, and for the other, 175 dinars. I save some money for the son who is a soldier. I also give him part of the food supplies I receive from the government, since he is working in the provinces. Whatever remains each month lasts me for 10 days. During the rest of the month I buy from the open market. I have to borrow money almost every month. I return the amount borrowed from the pensions I receive, then borrow again."

“When my husband was alive, I never felt the burden of the family since he was a hard worker. He was a taxi driver. But now I have learned to live day by day. In the past few years, I sold the family car. My son now has to rely on other means of transport. Most of the money I received from this sale is finished now. During the war, I stopped receiving the pensions. We could survive only on borrowed money. Nothing remained that I could sell.”

“With the blink of my eyes, I lost half my family. I sometimes wonder how I have managed to remain alive.” Her neighbour mentioned that she often finds Um Samir talking to herself. Whenever she listens to music she thinks that, if her sons were alive, they would be married and she would have played the music for them. In one photograph, her younger son, Raad, is seen standing against a tree. This is the same tree which is in the courtyard. Lost in her thoughts, Um Samir keeps kissing the tree as it stands witness to all this sorrow.

When we asked the favour to take a picture of her sons, she replied that she would be honoured. She wanted us to take two pictures of her with photographs of her two sons on each side of her: one with her looking at one son, and one with her looking at the other.

What are her hopes for the future? Um Samir looked straight at us and replied, “I just want God to save those who remain, they are my future.”

List of References

- Al-Khayyat, S. (1990): *Honour and Shame: Women in Modern Iraq* (London: Saqi Books).
- Brittain, V. (ed) (1991): *The Gulf Between Us: The Gulf War and Beyond* (London: Virago).
- CARDRI (1989): *Saddam's Iraq - Revolution or Reaction?* (London: Zed).
- Central Statistical Organisation (1990): *Annual Abstract of Statistics* (Baghdad: Ministry of Planning).
- Cleaver, T., and Wallace, M. (1990): *Namibia Women in War* (London: Zed).
- Drèze, J., and Gazdar, H. (1991): "Hunger and Poverty in Iraq, 1991", contribution to the Study Team report.
- Moghadam, V.M. (1991): "The Persian Gulf War and Women in the Middle East", UNU/WIDER, Helsinki.
- Ridd, R. and Callaway, H. (1986): *Caught up in Conflict*.
- UNICEF (1989): "Women of Iraq", memo, UNICEF, Baghdad.

RESPONSES IN PERCENTAGE

I. PERSONAL HISTORY

Age group of interviewees:

15-24 years	- 6
25-29 years	- 14
30-39 years	- 25
40-49 years	- 22
50 + years	- 13

Marital status:

Married	- 60
Widowed	- 15
Single	- 2
Divorced	- 2
Abandoned	- 1

Occupational status:

Employed	- 8
Housewives	- 63
Housewives & informal labour	- 9

Number of children:

None	- 2
1 - 4	- 36
5 - 8	- 25
above 8	- 15
n.a.	- 2

Size of household:

1 - 5	- 18
6 - 10	- 31
11 +	- 31

II. ECONOMIC SITUATION

(in percentage)

Income at time of interview:

Below 200	- 55%
200 - 400	- 30%
400 - 600	- 6%
600 +	- 4%
n.a.	- 5%

Home owners: - 66%

Additional
property: - 28%

Women who sold gold or other items:	- 55%
Families who incurred debts:	- 48%
Food rations sufficient:	- 0

III. HEALTH

5 Kilometer proximity of health service:	- 77%
Ill/dead family members in last 12 mths:	- 68%
Pregnancies in family or illness in neigh.:	- 77%
Medicine availability decrease:	- 61%
Availability of clean water:	- 42%
Decrease in gabage collection:	- 41%
Negative health impact on women: (menstrual disturbance, hair loss, skin diseases)	- 58%

IV. SOCIAL IMPACT

Added responsibilities:	- 80%
More resp. than men:	- 74%
Males involved in war & civil unrest:	- 68%
Leisure time decreased:	- 46%
Family not at home:	- 35%
Women divorced, widowed & seperated:	- 17%

V. PSYCHOLOGICAL ASPECT

Believed anyone
would die or was
in danger during
war: - 37%

Leave home
during bombing or
civil disturbances: - 47%

Have been
Psychologically
effected: - 59%

Members of family
psych. effected: - 73%

Bad dreams: - 46%

VI. FUTURE ASPIRATIONS

God knows: - 40%
Pessimistic: - 40%
Optimistic: - 20%

HARVARD STUDY TEAM

Food Consumption Questionnaire (for households only)

LOCATION:

NUMBER OF HOUSEHOLD MEMBERS: Above 10: Below 10:

a) Open Market

What prices did you pay for the following commodities:

	This month (August 91)	Before crisis (One year ago)
1. Wheat flour		
2. Bread		
3. Rice		
4. Meat (lamb)		
5. Meat (beef)		
6. Milk (fresh)		
7. Milk (canned)		
8. Cooking oil		
9. Sugar		
10. Tea		
11. Chick-peas		
12. Tomato		
13. Onions		
14. Potatos		
15. Dates		
16. Eggs		
17. Infant formula		

[Note to surveyor: Please make clear the units used.]

b) Public Distribution System (check ration card if possible)

(i) How much of the following foods did you obtain per person, and at what price:

	This month (August 1991)		3 months ago (May 1991)
	Quantity Price	Quantity	Price
1. Wheat flour			
2. Bread			
3. Rice			
4. Cooking oil			
5. Sugar			
6. Infant formula			
7. Other foods (specify)			

[Note to surveyor: If adults and children get different rations, note the adult rations - ignore children!]

(ii) What was your total consumption of the following commodities this month:

1. Wheat flour
2. Bread
3. Rice
4. Cooking oil
5. Sugar
6. Infant formula

(iii) Was there any time since August 1990 when you did not receive any rations? If so, which month, and for what reason?

(iv) What difficulties do you see, or have you experienced, in the functioning of the Public Distribution System? How can this system be improved?

c) Dietary Patterns (note answers in respondent's own words)

1. Which was the hardest month for meeting food needs since August 1990?
2. Which food items did you give up from your original diet during that month?
3. What were the main components of your diet during that month?
4. What total amount of wheat-flour does your household normally consume in a week, and how much was your consumption per week during that month?

Normal: During hardest month:

5. During that month, were you sometimes skipping meals, and if so how frequently?

IN THE SPACE BELOW, NOTE ANY FURTHER OBSERVATIONS OF INTEREST (EITHER YOUR OWN OR MENTIONED BY THE RESPONDENT), CONCERNING THE PUBLIC DISTRIBUTION SYSTEM (refer to last paragraph of “guidelines” for a sample of noteworthy issues).

APPENDIX 1
WOMEN'S INVESTIGATIVE STUDY - QUESTIONNAIRE

BACKGROUND

- 1) Name (Optional)
- 2) Address
- 3) Age
- 4) Education
- 5) Occupation before and after Aug. 2, 1990
- 6) Marital status
- 7) Age at marriage
- 8) Number of children
- 9) Size of household (extended kin)

ECONOMIC SITUATION

- 1) Family income sources before and after Aug. 2, 1991
- 2) What changes did this bring in your daily life? How did you cope with these changes?
- 3) Did you have to sell or mortgage any of your assets since Aug. 2 ? Which assets and why?
- 4) Have you incurred any loans since Aug. 2?
- 5) Who does your house/land belong to?

HEALTH AND SANITATION

- 1) Which is the nearest public or/and private health service that is available to you?
- 2) Did you or any of your family members fall ill or die in the last one year?
- 3) Did any of your neighbours or relatives fall ill or die in the last one year? If yes, details. i.e. who, what kind of illness, treatment, difficulties faced, if any.
- 4) Were you or any women in your family or neighbourhood pregnant in the last year? If yes, details (prenatal, perinatal and postnatal care and health of the mother)
- 5) Do you suffer from any ailments? (diabetis, heart condition, high blood pressure - do you take medicine to keep your ailments under control? (has your menstrual cycle been disturbed)
- 6) In the last one year, have the prices medicines increased and have they been easily available.
- 7) What is the drinking/other water source? Mention the difficulties faced if the water is scarce. If the water is poor in quality, mention the precautions taken to purify it, if any.
- 8) Who collects the garbage in your neighbourhood? Is it collected regularly?

Points to be Observed

- 1) Health of children below 1 year and between 2–5 years.

- 2) Health of lactating mothers, if any.
- 3) Proximity, facilities provided and other details of the nearest health center.
- 4) General sanitation in the household and nearby environment.
- 5) Conditions of sewage system.

SOCIAL ASPECTS WITHIN THE FAMILY AND SOCIETY

- 1) Do you feel that your responsibilities (domestic and others) have increased since August 2 ?
- 2) What do your daily chores include? (Go over a whole day with her). Compare her chores with those of other members of the household, especially male members.
- 3) How do you feel about these added responsibilities?
- 4) In what ways has the war brought changes to your personal life? (ex. long absence of male members from the household)
- 5) Have you noticed any change in interaction patterns within your family? (relationship with husband ect.)
- 6) Have you noticed any change in interaction patterns between neighbours and/or relatives since August 2 ?
- 7) What do you do when you are not working? (activities which could be possible sources of emotional outlet ex. socializing with neighbours)
- 8) Are all the members of your family currently at home? If no, who is away and where? How do you feel about their absence.
- 9) Have there been any instances of divorce or widowhood in your family, relatives and neighbourhood?
- 10) Was your husband, son or any male member involved in the last war? Have you lost any members of your family.
- 11) Do you feel that in the last year there has been an increase in the number of moral problems in your community?
- 12) Do you know of any women that have gotten into trouble or been harrassed sexually?
- 13) How would you assess your situation as well as that of your women relatives and neighbours as a consequence of the sanctions and the war?

PSYCHOLOGICAL IMPACT

- 1) Did you believe that you or any member of your family would die or be hurt as a result of the a) the allied bombings and/or b) the civil disturbances.
- 2) Did you live in your home during the entire duration of the last 12 months. If no, where did you go and why?
- 3) Have you considered moving to another part of Iraq or outside the country? If yes, where would you like to live and why? Why no?
- 4) Do you feel that any member of your family has been psychologically effected by this last war?

- 5) Do you have dreams? What do you dream about?
- 6) Have you heard that there has been greater family violence since the last year?
- 7) What changes do you think this war has brought to your life, your family, and the society?

FUTURE ASPIRATIONS:

What are your hopes and aspirations for yourself and your children?

MAP OF IRAQ AND LOCATIONS WHERE THE STUDY WAS CONDUCTED

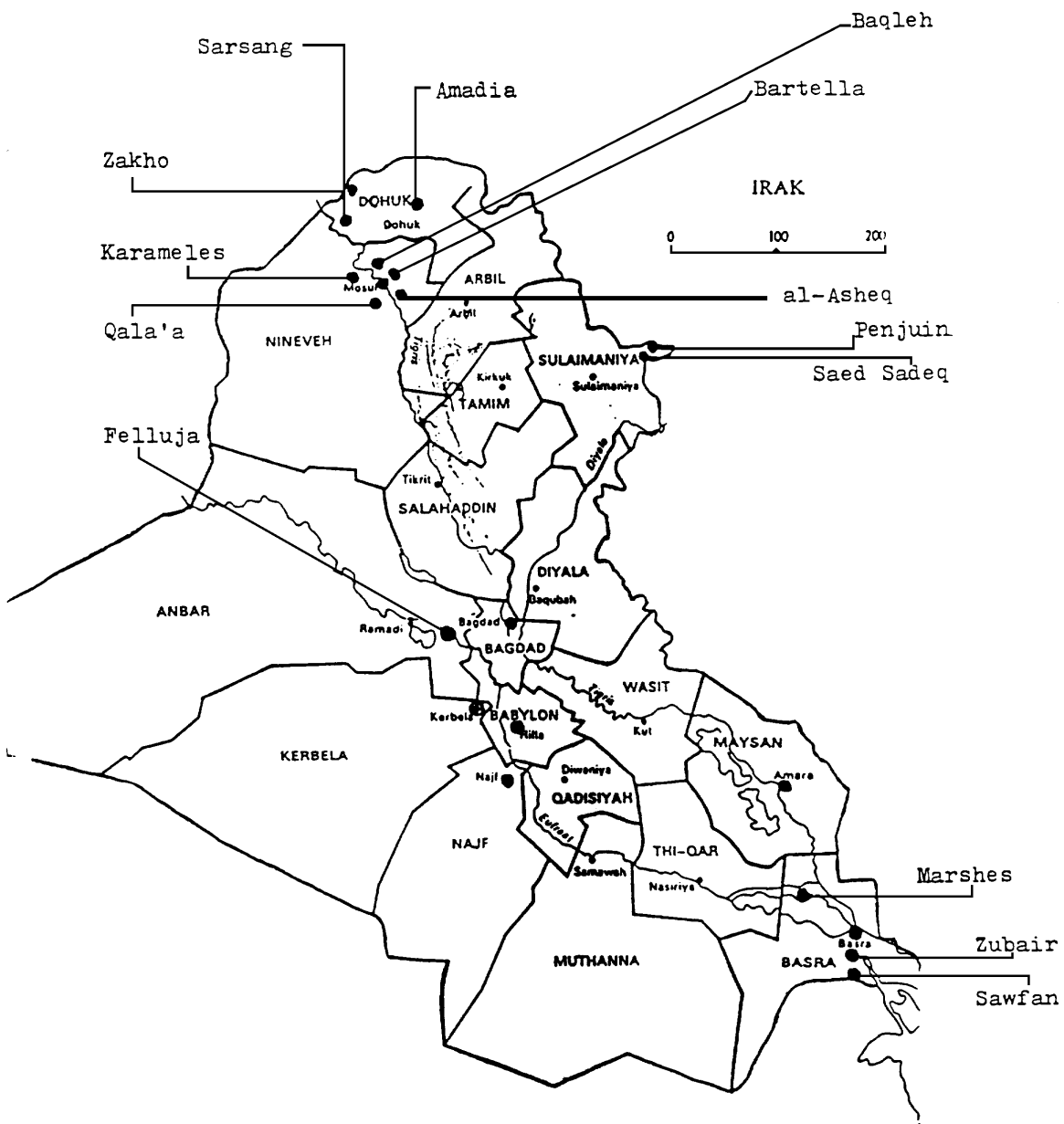


Table 1: Number of Respondents in Different Locations

Governorates	Location	Rural	Urban	Total
Anbar	Felluja	–	1	1
Babel	Babel	2	–	6
	Abasia	1		
	Hillah	–	1	
	Muharibin	–	2	
Basra	Abila	–	5	19
	Al Khaliliya	–	1	
	Al Murab	–	1	
	Hay Al Zuhur	–	1	
	Mishrag	–	1	
	Safa	–	1	
	Safwan	3	–	
	Zubair	2	2	
	Bedeh (Marshes)	2	–	
Baghdad	Aadhamia	–	3	23
	Al Ameria	–	5	
	Al Baya'a	–	1	
	Al Jadida	–	2	
	Al Shula	–	1	
	Campsara	–	1	
	Athalith	–	1	
	New Baghdad	–	2	
	Saddam City	–	7	
Dohuk	Admadia	2	–	7
	Dohuk	–	2	
	Sarsang	1	–	
	Zakho	2	–	
Kerbela	Abasia	–	1	4
	Al Husseini	–	1	
	Hay Ramdan	–	1	
	Kerbela	–	1	
Najaf	Al Ansar	–	3	4
	Najaf	–	1	
Nineveh	Al Anheq	1	–	
	Bartela	2	–	
	Baqla	1	–	
	Karamad	–	2	
	Karameles	1	–	

	Masul	-	3	
	Qalaa	1	-	11
Maysan	Amar	-	1	1
Sulaimaniya	Penjin	1	-	
	Saed Sadeq	3	-	4
TOTAL		25	55	80

Source: Field survey.

Table 2a: Female Population by Marital Status and Age Group (1987)

Age Group	Total No. in Population	Percentage Distribution of women by marital status in each age group				
		Never Married %	Married %	Divorced %	Widowed %	Unknown %
12-14	605806 (12 %)	85	1.5	.02	.03	14
15-19	912324 (19 %)	72	18	.3	.4	9
20-24	707910 (14 %)	41	51	1	2	5
25-29	487142 (10 %)	19	73	1	4	3
30-34	487578 (10 %)	10	81	1	5	3
35-39	369030 (8 %)	5	85	1	6	3
40-49	474973 (10 %)	4	82	2	10	2
50-59	349422 (7 %)	3	73	1	21	2
60 +	443893	2	49	1	46	3
Unknown	103712 (2 %)	7	15	.3	3	75
TOTAL:	4941790	34	50	.9	8	7
Populat. Above the age of 12	(49 %)					
Total female	7939310	21	31	1	6	4

Source: Annual Abstract of Statistics, 1990 (Baghdad: Central Statistical Organisation).

Table 2b: Percentage distribution of the Iraqi Population by Educational Status (age 10 years and over, as on October 1987)

Educational Status	Rural		Urban		Total	
	Female %	Male %	Female %	Male %	Female %	Male %
Illiterate	48	30	29	16	35	20
Read only	2	2	2	1	2	1
Read and write	23	24	24	23	24	24
Primary	16	23	20	25	19	24
Intermediate	1	6	6	9	5	8
Secondary	.4	2	3	5	3	4
Vocational	.3	2	2	3	2	3
Diploma	.1	.8	2	3	1	2
Bachelor	.1	.9	2	4	2	2.8
Higher Diploma	.01	.07	.1	.2	.08	.2
Master Degree	.003	.03	.1	.2	.05	.1
Ph. D	.0009	.004	.03	.1	.02	.08
Higher Professional Degree	.004	.004	.008	.01	.007	.01
Others	.1	.1	.2	.2	.2	.1
Unknown	9	10	9.1	11	9	11

Source: Annual Abstract of Statistics, 1990 (Baghdad: Central Statistical Organisation), based on census data. These figures exclude Iraqis abroad.

Table 2c

Economically Active Female Population by Occupation (age 7 and over, as on October 1987)

Occupation	% of economically active female population
Professional/Technician & related	36
Legislators/Administration/Directors	0.5
Executive Officials/Clerks/related	21
Sales employees	2
Service Employees	6
Employees in agriculture, forestry, animal husbandry	15
Employees in production and related	10
Unclassified employees	8
Unknown	.8
Unemployed	8
Total no. of economically active female population	460230 (12 %)

¹ In brackets, percentage of the total economically active population. Economically active women represent 5.8% of the total female population of Iraq.

Source: Annual Abstract of Statistics, 1990 (Baghdad: Central Statistical Organisation).

**INTERNATIONAL STUDY TEAM
BIOGRAPHIES**

**DELEGATES ON
INTERNATIONAL STUDY TEAM ON IRAQ
23 AUGUST – 6 SEPTEMBER 1991**

Laila Abdelnour
Mahmoud Aqeel
Bill Arkin
Elisabeth Benjamin
Bela Bhatia
Robert Chase
Tim Cote
Godelieve Dehaes
Julia Devin
Walid Doleh
Steven Donziger
Jean Dreze
Atle Dyregrov
Haris Gadzar
Dave Hendricks
Don Hernandez
Eric Hoskins
Mahmoud Al-Khoshman
Karen Kuiper
Jilali Laaouej
Abdul-Wahab Matar
Ross Mirkarimi
Roger Normand
Ahmad Obeidat
Farouq Al-Omari
Patrick Osewe
Megan Passey
Al Picardi
Warren Piper
Saleh Al-Qaderi
Abdul Karim Qamhieh
Magne Raundalen
Andy Ryan
Muhammad Hussam Sallam
Huib Schoonhoven
Mariam Shahin
Saher Shuaqidef
Mary Kay Smith
Joel Stettenheim
Kamel Al-Tallaa
Hedwig Von Heck
Sarah Leah Whitson
Sarah Zaidi

PUBLIC HEALTH SURVEYORS

Muna Abdulhameed
Ghassan Abusitteh
Nisreen Alami
Kholoud Athamneh
Riham Athamneh
Ohud Bata
Hussam Bushnaq
Waleed Gharaybeh
Samar Hassan
Hussein Jaafar
Saeed Jaradat
Natalie Kakish
Ghada Konash
Lamees Marji
Ismail Matalka
Tahani Momani
Lulwa Mutawi
Taline Najjar
Mu'tassem Obeidat
Rania Orabi
Rita Qumsieh
Dana Sajdi
Rasha Sayegh
Shiren Shahin
Faten Al-TaHER
Raja Tobeishat
Shorouq Tobeishat
Nadine Touqan
Rana Tumaira

TEAM INTERPRETERS

Khaled Abdulhamid
Raghda Azaizieh
Haya Dajani
Mubadda Dallal
Saad Hamid
Abdullah Mutawi
Amer Sunnaa
Dima Touqan
Rana Zoubi

BIOGRAPHIES

Leila Abdelnour B.Sc and PhD in chemistry from Glasgow University in Scotland. She has taught at the Lebanese University in Beirut and is currently at the Jordan Un iveristy in Amman. Part of her research was on organic pollutants in Jordan's water. She joined the Harvard Study Group as a member of its environmental team.

Elisabeth Benjamin Master of Science, Health Policy and Management at Harvard School of Public Health and is currently working on a J.D. from Columbia Law School. B.A. was in Development Studies at Brown Unveristy. Founded the Health and Human Rights Committee at Harvard School of Public Health. Prior to attending law school she worked on public health projects in India, the Philippines, Morocco, Tunisia, Haiti, and Mattapan. She is a member of Amnesty International, the American Public Health Association and the Lawyers' Committee for Human Rights Lawyer-to-Lawyer Network. Coordinator for the National Lawyers Guild Chapter at Columbia Law School. Ms. Benjamin has co-authored a chapter on health care financing in Mobliziing Health Care in Times of Economic Crisis, Arbor Press, Cambridge, 1988 and has published numerous articles on cross-cultural issues in health access in Project Mattapan Newsletter.

Bela Bhatia L.L.B., University of Gujarat, 1989. M.A. in Social Work, Tata Institute of Social Sciences, Bombay, and B.SC and M.S. in Child Psychology from the University of Baroda, 1983. Bela Bhatia is a lawyer and freelance writer. She has worked for five years as a human rights activist in rural Gujarat, organizing women's action groups. Her most recent works include "Official Drought Relief Measures: A Case Study of Gujarat" Social Action, 1988) and "Lush fields and Parched Throats: The Political Economy of Groundwater in Gujarat" (forthcoming in the Working Paper series of the World Institute for Development Economics Research, Helsinki).

Dr. Robert Chase M.D., McMaster University, 1985. Dr. Chase is a specialist in community medicine and occupational health. His field work includes work in Thailand, the Dominican Republic and India.

Dr. Godelieve Dehaes Dr. Dehaes received her degree in medicine with a specialization in public health care from Catholic University in Leuven, Belgium. She has worked and studied in China and has done research concerning the structure of public health care in China and Belgium. Her research has been presented in television documentaries. She is an active member of Doctors for the Third World.

Mary Kawar M.Sc., 1989, Londond School of Economics, Social Policy and Planning and B.A., 1987 at Tufts University, Anthropology. Mary Kawar is a PhD student in Gender Studies at the London School of Economics. She has conducted research on "Women and Traditional Medicine in Southern Jordan" and "Population Policy and Gender Needs in Jordan", and has worked as Research Officer for the International Labour Organization project on "Employment Promotion and Manpower Planning" at the Ministry of Planning in Amman (1990-91). She is founding member of the Women Studies Center in Amman. Her PhD thesis deals with the expansion of female employment in Jordan.

Mahmoud Al Khoshman B.Sc in Chemical Engineering (Environmental). Mr. Khoshman also completed advanced courses in Computer Applications. His area of expertise is in Industrial Pollution.

Dr. Jilali Laaquej Dr. Jilali Laaquej received her degree in medicine with a specialization in public health from the University of Liege, Belgium. He has worked in public hospitals and public health care centers in Belgium and is an active member of Doctors for the Third World.

Abdulwahab Aqeel Matar B.Sc, 1973, in chemical engineering in Sarajevo, Yugoslavia. He also has a diploma in Environmental Pollution Control (1975), Waste Water Treatment (1981), Waste Water Technology (1982), and Water Resources Engineering (1985). He currently Waste Water Services Operation Section Head at the Water Authority of Jordan. He is also a member of the Jordan Engineering Association and of Jordanian Society for the Control of Environmental Pollution.

Ross B. Mirkarimi Ross B. Mirkarimi has completed graduate studies in international economics and independent environmental studies at Saint Louis University. He is currently employed by the Arms Control Research Center (ARC), a San Francisco based nonprofit organization. In the ARC he is responsible for projects which study the impact of war and military testing on the environment.

Roger Nor mand M.T.S. expected 1992, Harvard Divinity School; J.D. expected 1992, Harvard Law School; B.A. Middle East Studies, 1987, Amherst College. Asia Watch (1990–1991); Cambodia Documentation Commission Summer 1989; Catholic Office of Relief and Refugees 1987–88; Fieldwork Editor, contributor to the Harvard Human Rights Journal. Publications include: “Refugee Voices: Inside Site 2,” *The Oxford Journal of Refugee Studies* (Vol.3 No.2, 1990); “The Teachings of Chairman Pot” *The Nations* (August 27/September 3, 1990) reprinted in The London Guardian (England), The Melbourne Sunday Herald (Australia), and El Observador de la Actualidad (Spain); “The Weight of Human Wrongs: Human Rights in Cambodian Refugee Camps” *The Harvard Human Rights Journal* (Spring 1990).

Megan Passey M.D. 1986, Newcastle University, Australia; MSc General 1990, Masters in Epidemiology and Population Science, expected 1991, Harvard School of Public Health. Research assistant, Women’s Reproductive Health Group researching risk factors for adverse pregnancy outcomes, 1991; teaching assistant “Design and Analysis of Health Projects for Developing Countries” 1991; course research assistant Population Sciences: “Dynamic of Health and Fertility Change” 1990. Locum General Practitioner, Susan McDonald Pty. Ltd, Armidale, NSW, Australia, 1989; inter and resident medical officer, Gosford District Hospital, Gosford, NSW, Australia, 1987–88; intern, Obstetrics, Gaja Mada University, Yogyakarta, “Indonesia, 1986. Co-author of a soon to be published article, “Ventilatory Standards for Australian Aboriginals” submitted to the Medical Journal of Australia, 1991.

Al Picardi Al Picardi is an engineer who studied Biology and Chemistry at Massachusetts Institute of Technology (MIT) and William and Mary Universities. He worked for the United States Environmental Protection Agency and the Virginia State Water Board before founding the Environmental Assessment Group (EAG), and independent corporation specialized in broad scale environmental evaluation. In the EAG he is responsible for multi-disciplinary environmental assessments for industrial facilities.

Warren Piper Warren Piper retired in 1985 from Stone & Webster Engineering Corporation as a Senior Vice-President. During 38 years with the Stone & Webster, he held the positions of Chief Electrical Engineer and Director of Construction, in which capacity he oversaw the engineering, design, and construction of numerous power stations and transmission systems. Before retirement, he was a Registered Professional Engineer in five states. Mr. Piper is a senior member of the Institute of Electrical and Electronic Engineers.

Abdel Kareem Qamhieh B.Sc, 1969, in Electrical Engineering from Azher University in Egypt. He is head of Electrical Maintenance section and Manager Deputy of Hussein power station for Jordan Electricity Authority.

Magne Raundalen Magne Raundalen received his degree in psychology from Oslo University. He is the director of Research for Children Program, Center for Crisis Psychology, Bergen, Norway. His most recent work has been investigations in Uganda (1984–89 and in Mozambique 1989–91). He has published more than ten books on topics related to child psychology with special focus on children under treat: children with cancer, childrens fear of nuclear weapons, children and war.

Mohammed A. Sallam Control Engineer for the Governorate of Amman, Jordan. His responsibilities include water production, distribution, and water quality monitoring within the system. He heads a team of engineers and technicians to deal with the problem of cross-connections within the network. Engineer Sallam also has had experience in design of sewage systems during his earlier years with the Authority. He is a member of the Jordanian Society of Engineers and the American Society of Civil Engineers.

Marian M. Shahin B.A., 1983, in International Affairs at American University, Paris. She is a staff reporter with the Jordan Times, as well as a free lancer with the Independent in London. She was researcher at the Royal Scientific Society in Amman, Jordan. She has also worked as co-producer on two documentaries for ZDF - 1990 "Women in Jordan", 1991 "Portraits of Women in Iraq in the Post War

Sarah Leah Whitson J.D. expected 1991, Harvard Law School; B.A., Political Science and Middle Eastern Studies, 1988, University of California at Berkeley. Chairperson, Middle Eastern Law Students Association; member of the Women's Law Association at Harvard Law School. Researched human rights and women's health issues for Legal Aid and Muslim personal laws for the Islamic Research Institute, both in India, Summer. Her findings will be published in an article in the 1991 Columbia Human Rights Law Journal. In 1986-87, Ms. Whitson researched women's legal issues in Egypt.

Sarah Zaidi MSc., Harvard University and B.A., Brown University. Sarah Zaidi is currently a doctoral student at the Harvard School of Public Health in the Department of Population and International Health. Her work is concentrated in areas of reproductive health of women and their reproductive outcome. Her research also focuses on issues of hunger and health and the demography of Islamic countries. Last year, she was the recipient of MacArthur Fellowship on Population and Development at the Center for Population and Development Studies at Harvard University.